IAU Symp 269, POST MEETING REPORTS

C.Barbieri, University of Padua, Italy

Content

(i) a copy of the final scientific program, listing invited review speakers and session chairs;

(ii) a list of participants, including their distribution on gender

(iii) a list of recipients of IAU grants, stating amount, country, and gender;

(iv) receipts signed by the recipients of IAU Grants (done);

(v) a report to the IAU EC summarizing the scientific highlights of the meeting (1-2 pages).

(vi) a form for "Women in Astronomy" statistics.

(i) Final program

Conference: Galileo's Medicean Moons: their Impact on 400 years of Discovery

(IAU Symposium 269) Padova, Jan 6-9, 201

Program

Wednesday 6, location: Centro San Gaetano, via Altinate

16.0 0 – 18.00 meeting of Scientific Committee (last details on the Symp 269; information on the IYA closing ceremony program)

18.00 – 20.00 welcome reception

Thursday 7, morning: Aula Magna University

8:30 – late registrations

09.00 – 09.30	Welcome Addresses (Rector of University, President of COSPAR, Representative of ESA, President of IAU, Mayor of Padova, Barbieri)

Session 1, The discovery of the Medicean Moons, the history, the influence on human sciences **Chair: R. Williams**	Speaker	Title

09.30 – 09.55 (1)	G. Coyne	Galileo's telescopic observations: the marvel and meaning of discovery
09.55 – 10.20 (2)	D. Sobel	Popular Perceptions of Galileo
10.20 – 10.45 (3)	T. Owen (read by Scott Bolton)	The slow growth of human humility
10.45 – 11.10 (4)	G. Peruzzi	A new Physics to support the Copernican system. Gleanings from Galileo's works
11.10 – 11.35	**Coffee break**	
Session 1b **Chair: T. V. Johnson**		
11.35 – 12.00 (5)	A. Righini	Telescope in the making, the Galileo first telescopic observations
12.00 – 12.25 (6)	M. Mendillo	The Appearance of Medicean Moons in 17th Century Astronomical Maps and Charts - How Long Did it Take?
12.25 – 12.50 (7)	K. Aksnes	What we have learned from the eclipses and occultations of the Galilean moons

12.50 – 14.20 Lunch in the Basilica adjacent to Aula Magna

14.20 – 14.40 Transfer to Palazzo San Gaetano (10 min guided walk)

Session 2, The Medicean Moons, Jupiter's system, the legacy of NASA Galileo **Chair: N. Schneider**	Speaker	Title
14.45 – 15.10 (8)	T. V. Johnson	Modern Exploration of Galileo's New Worlds
15.10 – 15.35 (9)	M. G. Kivelson	Medicean Moons Sailing Through Plasma Seas
15.35 – 16.00 (10)	S. Chakrabarti	Ultraviolet Aurora on Jupiter: A Magnetic Connection with the Sun and the Medicean Moons
16.00 – 16.30 (11)	**Coffee break**	
Session 2b **Chair: M. Fulchignoni**		

16.30 – 16.55 (12)	R.M. Lopes	Io After the Galileo Spacecraft: Results and unanswered questions
16.55 – 17.20 (13)	S. Okano	Diffuse Sodium in the Solar System
17.20 – 17.45 (14)	N. Schneider	Jupiter and Io NaD questions
17.45 – 18.10 (15)	W. Ip	The Jovian Rings
18.10 – 19.00	Poster session	Schneider; 9 poster presentations 1 min 1 slide each before going to see the poster (Casotto, Cheung, Clarke, DaPonto, Fulvio, Grava, Noyelles, Pluchino)

21:00 – 22:30 Concert (Sala dei Giganti, Piazza Capitaniato). The concert is kindly offered by the Galilean School of Higher Education (http://www.scuolagalileiana.unipd.it/en/index.html).

Friday 8 – Palazzo San Gaetano

Session 3, Future missions to Jupiter **Chair: Th. Encrénaz**	Speaker	Title
09.00 – 09.25 (16)	S. Bolton	Future exploration of Jupiter with the mission Juno
09.25 – 09.50 (17)	M. Blanc	The search for habitable worlds in the Galilean moons 400 years after their discovery: EJSM, an international space program for the modern exploration of the Jupiter system
09.50 – 10.15 (18)	R. Pappalardo	Past and Future Exploration of Europa
10.15 – 10.40 (19)	L. Zelenyi	EUROPA LANDER: scientific rationale and technical implementation
10.40 – 11.05 (20)	**Coffee break**	
Session 4, Our solar system after Galileo, the grand vision **Chair: R. Pappalardo**		
11.05 – 11.30	S. Atreya	"Atmospheric" moons Galileo would have loved
11.30 – 11.55 (21)	L. Prockter	The exploration of Mercury by the MESSENGER spacecraft
11.55 – 12.20 (22)	A. Coradini	The formation of regular satellites
12.20 – 12.45 (23)	B. Foing	The Moon as seen from recent space probes (400 years after Galileo)

12.45 – 14.05 Lunch break Palazzo San Gaetano

Session 4b , Our solar system after Galileo, the grand vision **Chair: A. Coradini**	Speaker	Title
14:05 – 14.30 (24)	M. Grande	Chandrayaan Lunar results
14.30 – 14.55 (25)	P. Smith	Imag(in)ing Mars: from Galileo to Phoenix
14.55 – 15.20 (26)	M. Fulchignoni	"SMAISMRMILMEPOETALEUMIBUNENUGTTAURIAS"
15.20 – 15.45 (27)	Th. Encrenaz	Jupiter and the other giants: a comparative study
15.45 – 16.15 (28)	**Coffee break**	
Session 4c **Chair: S. Atreya**		
16.15 – 16.40 (29)	A. Morbidelli	*Eppur si muove*: giant planets migration in our Solar System during the gas-disk and planetesimal-disk phases
16.40 – 17.05 (30)	H.U.Keller	Comets - from Galileo to Rosetta
17.05 – 17.30 (31)	A. Barucci	The outer Frontiers of Solar System
17.30 – 17.55 (32)	C. Pilcher	Astrobiology of Icy Worlds
17.55 – 19.00	Poster session	Atreya; 9 poster presentations, 1min 1 slide each before going to see the poster (Blanc, Bortoletto, Cremonese, Galletta, Lorenzini, Lupishko, Marchi, Pozhalova, Zelenyi)

20.00 Conference Dinner, tour of Galileo's food and wine guided by Prof. A.RIghini (Arcetri) , location Army's Officers Club, Prato della Valle

Saturday 9 Palazzo San Gaetano

Session 5a, New telescopes, new solar systems, new people out there? **Chair: M. Mendillo**	Speaker	Title
09.00 – 09.25 (33)	K. Noll	The Galilean satellites in context: Comparisons with HST and JWST
09.25 – 09.50 (34)	M. Tarenghi	New Telescopes
09.50 – 10.15 (35)	P. Salinari	High Contrast Observations with New Telescopes
10.15 – 10.40 (36)	M. Coradini	ESA plans for Solar System exploration
10.40 – 11.05 (37)	E. Flamini	ASI plans for Solar System exploration

11.05 – 11.30	**Coffee break**	
Session 5 b **Chair: C. Barbieri**		
11.30 – 11.55 (38)	G. Consolmagno (read by G. Coyne)	New Worlds, New Civilizations?
11.55 – 12.20 (39)	Roger Bonnet	concluding remarks
		End of Symposium

(ii) list of participants, underlined <u>females</u>

Surname Name Institution Country e-mail

AKSNES KAARE UNIVERSITY OF OSLO NORWAY kaare.aksnes@astro.uio.no
ATREYA SUSHIL UNIVERSITY OF MICHIGAN USA atreya@umich.edu
BACCICHET NICOLA UNIVERSITY OF PADUA Italy nicola.baccichet@hotmail.it
BARBIERI CESARE UNIVERSITY OF PADUA Italy cesare.barbieri@unipd.it
<u>BARUCCI MARIA ANTONIETTA</u> OBS. DE PARIS FRANCE antonella.barucci@obspm.fr
BENACCHIO LEOPOLDO INAF OAPD Italy leopoldo.benacchio@oapd.astro.it
BERTINI IVANO UNIVERSITY OF PADUA Italy ivano.bertini@unipd.it
BERTOLA FRANCESCO UNIVERSITY OF PADUA Italy francesco.bertola@unipd.it
BIANCHINI ANTONIO UNIVERSITY OF PADUA Italy antonio.bianchini@unipd.it
BLANC MICHEL ECOLE POLYTEC. DE PARIS FRANCE michel.blanc@polytechnique.edu
BLANCO CARLO CATANIA UNIVERSITY Italy cblanco@oact.inaf.it
BOLTON SCOTT SWRI USA sbolton@swri.edu
BONNET ROGER MAURICE ISSI SUISSE silvia.wenger@issibern.ch
BORNEMANN WILFRIED EADS ASTRIUM GMBH SAT RDT
wilfried.bornemann@astrium.eads.net
BORTOLETTO ALEXANDRE LABORATORIO NACIONAL DE ASTROFISICA BRAZIL
abortoletto@lna.br
BUSETTO GIOVANNI UNIVERSITY OF PADUA Italy giovanni.busetto@unipd.it
CALVANI MASSIMO INAF INAF OAPD Italy massimo.calvani@oapd.inaf.it
CANNONE DARIO UNIVERSITY OF PADUA Italy dario.rigel@hotmail.it
CAPPELLARO ENRICO INAF INAF OAPD Italy enrico.cappellaro@oapd.inaf.it
CARIOLARO GIANFRANCO UNIVERSITY OF PADUA Italy cariolar@dei.unipd.it
<u>CARNAGHI BENEDETTA LUCIANA</u> SARA SCUOLA GALILEIANA DI STUDI SUPERIORI Italy
benny_winnie_green@hotmail.it
CASANI JOHN JET PROPULSION LABORATORY USA jrcasani@jpl.nasa.gov
CASOTTO STEFANOUNIVERSITY OF PADUA Italy stefano.casotto@unipd.it
CENTRO SANDROUNIVERSITY OF PADUA Italy centro@pd.infn.it
CHAKRABARTI SUPRIYA BOSTON UNIVERSITY USA supc@bu.edu
CHEUNG SZE LEUNG HO KOON ASTRONOMICAL CENTER HONG KONG
cheung.szeleung@physics.org
CLARKE THEODORE SWRI USA tcclarke@earthlink.net
CONSOLMAGNO GUY SPECOLA VATICANA VATICAN CITY gjc@specola.va
<u>CORADINI ANGIOLETTA</u> INAF ROMA Italy angioletta.coradini@ifsi-roma.inaf.it
CORADINI MARCELLO ESA FRANCE marcello.coradini@esa.int
CORSINI ENRICO MARIAUNIVERSITY OF PADUA Italy enricomaria.corsini@unipd.it

COYNE GEORGE VATICAN OBSERVATORY VATICAN CITY gcoyne@as.arizona.edu
CREMONESE GABRIELE INAF OAPD Italy gabriele.cremonese@oapd.inaf.it
DALLA BONTA' ELENA UNIVERSITY OF PADUA Italy elena.dallabonta@unipd.it
D'ODORICO SANDRO ESO RDT sdodoric@eso.org
ENCRENAZ THERESE PARIS OBSERVATORY FRANCE therese.encrenaz@obspm.fr
FLAMINI ENRICO ASI Italy enrico.flamini@asi.it
FOING BERNARD ESA/ESTEC THE NETHERLANDS Bernard.Foing@esa.int
FORNASIER SONIA UNIVERSITE' DE PARIS FRANCE Sonia.Fornasier@obspm.fr
FULCHIGNONI MARCELLO OBS. PARIS UNIV. DENIS DIDEROT PARIS 7 FRANCE
marcello.fulchignoni@obspm.fr
GALLETTA GIUSEPPE UNIVERSITY OF PADUA Italy giuseppe.galletta@unipd.it
GAZZOLA MARCO UNIVERSITY OF PADUA Italy marco.gazzola.1@studenti.unipd.it
GRADARI SERENA UNIVERSITY OF PADUA Italy serena.gradari@unipd.it
GRANDE MANUEL IMAPS, ABERYSTWYTH UNIVERSITY UK mng@aber.ac.uk
GRAVA CESARE UNIVERSITY OF PADOVA Italy cesare.grava@unipd.it
IP WING HUEN INSTITUTE OF ASTRONOMY, NATIONAL CENTRAL UNIVERSITY TAIWAN
wingip@astro.ncu.edu.tw
JOHNSON TORRENCE JET PROPULSION LABORATORY, CALTECH USA
Torrence.V.Johnson@jpl.nasa.gov
KELLER HORST UWE MAX PLANCK INSTITUT FUER SONNENSYSTEMFORSCHUNG RDT
keller@linmpi.mpg.de
KIVELSON MARGARET UNIVERSITY OF CALIFORNIA LOS ANGELES USA
mkivelson@igpp.ucla.edu
LAZZARIN MONICA UNIVERSITY OF PADUA Italy monica.lazzarin@unipd.it
LOPES ROSALY JET PROPULSION LABORATORY USA Rosaly.M.Lopes-Gautier@jpl.nasa.gov
LORENZINI ENRICO UNIVERSITY OF PADOVA Italy
LUPISHKO DMITRIJ INSTITUTE OF ASTRONOMY OF KHARKIV V.N.KARAZIN NATIONAL
UNIVERSITY UKRAINE lupishko@astron.kharkov.ua
MAGRIN SARA UNIVERSITY OF PADUAItaly sara.magrin@unipd.it
MARCHI SIMONE UNIVERSITY OF PADUA Italy simone.marchi@unipd.it
MARTELLATO ELENA UNIVERSITY OF PADUA Italy elena.martellato@oapd.inaf.it
MATARRESE SABINO UNIVERSITY OF PADUA Italy matarrese@pd.infn.it
MCBRIDE KAREN UNIVERSITY OF CALIFORNIA, LOS ANGELES USA
space.mcbride@gmail.com
MENDILLO MICHAEL BOSTON UNIVERSITY USA mendillo@aol.com
MORBIDELLI ALESSANDRO NICE OBSERVATORY FRANCE Alessandro.MORBIDELLI@obs-nice.fr
NALETTO GIAMPIERO UNIVERSITY OF PADUA Italy naletto@dei.unipd.it
NOLL KEITH SPACE TELESCOPE SCIENCE INSTITUTE STATI UNITI noll@stsci.edu
NOYELLES BENOIT UNIVERSITY OF NAMUR BELGIE benoit.noyelles@fundp.ac.be
OKANO SHOICHI TOHOKU UNIVERSITY Japan okano@pparc.gp.tohoku.ac.jp
OMIZZOLO ALESSANDRO VATICAN OBSERVATORY ITALY alessandro.omizzolo@oapd.inaf.it
ORTOLANI SERGIO UNIVERSITY OF PADUA Italy
OWEN TOBY University of Hawaii USA owen@IfA.Hawaii.Edu
PAPPALARDO ROBERT JET PROPULSION LABORATORY, CALIFORNIA INSTITUTE OF
TECHNOLOGY USA robert.pappalardo@jpl.nasa.gov
PERUZZI GIULIO UNIVERSITY OF PADUA Italy peruzzi@pd.infn.it
PILCHER CARL ASTROBIOL. NASA USA carl.b.pilcher@nasa.gov
PIOTTO GIAMPAOLO UNIVERSITY OF PADUA Italy giampaolo.piotto@unipd.it
PIZZELLA ALESSANDRO UNIVERSITY OF PADUA Italy alessandro.pizzella@unipd.it
PLUCHINO SALVATORE INAF IRA, Italy s.pluchino@ira.inaf.it
POZHALOVA ZHANNA RESEARCH INSTITUTE NIKOLAEV ASTRONOMICAL OBSERVATORY
UKRAINE pza1900@mail.ru
PROCKTER LOUISE JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY USA
Louise.Prockter@jhuapl.edu

RIBEIRO BORTOLETTO DAIANA LABORATORIO NACIONAL DE ASTROFISICA BRASILE dbortoletto@lna.br
RIGHINI ALBERTO UNIVERSITY OF FLORENCE Italy righini@arcetri.astro.it
RODEGHIERO GABRIELE UNIVERSITY OF PADUA Italy gabriele.rodeghiero@studenti.unipd.it
SAADEH DANIELA UNIVERSITY OF PADUA SCUOLA GALILEIANA DI STUDI SUPERIORI Italy capt.kirk@inwind.it
SALINARI PIERO INAF ARCETRI Italy salinari@arcetri.astro.it
SANGIOVANNI GUIDO ASI Italy guido.sangiovanni@comune.vanzago.mi.it
SCHENK PAUL NASA USA schenk@lpi.usra.edu
SCHNEIDER NICK U COLORADO USA nick.schneider@lasp.colorado.edu
SEGATO ELISA UNIVERSITY OF PADUA Italy elisa.segato@unipd.it
SMITH PETER UNIVERSITY OF ARIZONA USA psmith@lpl.arizona.edu
SOBEL DAVA DISCOVER MAGAZINE USA ds23@optonline.net
SOMEDA CARLO GIACOMO UNIVERSITY OF PADUA AND ACCADEMIA GALILEIANA Italy galileiana@libero.it
SOMMA ROBERTO THALES ALENIA SPACE Italy roberto.somma@thalesaleniaspace.com
SORINI DANIELE UNIVERSITY OF PADUA SCUOLA GALILEIANA DI STUDI SUPERIORI Italy caparezza89@alice.it
TAMBURINI FABRIZIO UNIVERSITY OF PADUA Italy fabrizio.tamburini@unipd.it
TARENGHI MASSIMO ESO CHILE mtarengh@eso.org
TOSI FEDERICO INAF IFSI Italy federico.tosi@ifsi-roma.inaf.it
WILLIAMS ROBERT STSCI USA wms@stsci.edu
ZAKHAROV ALEXANDER Space Research Institute RUSSIA zakharov@iki.rssi.ru
ZELENYI LEV Space Research Institute RUSSIA lzelenyi@iki.rssi.ru
Among the 95 participants, 77 were men, and 18 women

(iii) list of recipients of IAU grants, stating amount, country, and gender

Surname	Name	Amount (Euro)	Country	Gender
Bortoletto	Alexandre	1750	Brazil	Male
Bortoletto	Daiana	1750	Brazil	Female
Cheung	Sze Leung	1500	Hong Kong	male
Ip	Wing Huen	1500	Taiwan	male
Keller	Horst Uwe	1000	Germany	male
Lupishko	Dmitrij	1000	Ukraine	male
Pluchino	Salvatore	300	Italy	male
Pozhalova	Zhanna	1000	Ukraine	female
Sobel	Dava	1400	USA	female

(iv) done

(v) Summary and Highlights of the Conference

The main aim of Symposium 269 was the celebration of 400th anniversary of the discovery of the Galilean Moons, in the very same place and dates of that great moment, and the elucidation of its impact on subsequent Science.

The speakers were by invitation only, all of them distinguished historians of science or scientists personally involved in the exploration of Jupiter and its Moons and of the solar system in general, from space and from ground.

The conference was opened to young scholars, who had the opportunity to submit and briefly illustrate poster contributions.

Therefore, it is essentially impossible for me to single specific talks out of such an impressive complement of contributions of the highest level. However, I regard the final conclusions drawn by Roger Bonnet as a beautiful conclusion of the Symposium. Roger was able to convey to the audience not only the beauty of research, but also the need to defend seemingly heretic ideas against popular belief or prejudice which may be present even in scientific and cultural circles. And finally, he expressed the gratitude of all scientists to a man who silently sat in the audience for the entire conference, and who was in the back of most NASA missions to Solar System, namely John Casani, chief engineer at JPL for many years. In particular, he was of fundamental importance for the success of the NASA GALILEO mission to Jupiter and its moons. The results of GALILEO and its legacy to future missions as JUNO had been masterly illustrated by Torrence Johnson, the chief scientist of the mission.

In conclusion, this is the highlight of the conference, that space missions and ground telescopes will bring to light many more fascinating aspects of our Solar System, and of other planets and earths that populate the Universe around us.

I'm sure that the many young researchers and students attending the conference have received an unforgettable inspiration for their future activities.

(vi) **Among the 95 participants, 77 were men, and 18 women**

International Astronomical Union
Union Astronomique Internationale

POST MEETING REPORT FORM

for meetings other than Joint Discussions and Special Sessions

Deadline for Submission: within 1 month after the meeting

the following information should be sent to the IAU Assistant General Secretary

1. Meeting Number: **S 270**

2. Meeting Title: **Computational Star Formation**

3. Coordinating Division:

4. Dedication of meeting (if any): None

5. Location (city, country): Barcelona (Catalonia, Spain)

6. Dates of meeting: 31 May – 4 June 2010

7. Number of participants: 219

8. List of represented countries: (30 countries) Australia, Austria, Belgium, Bulgaria, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Hungary, India, Italy, Japan, Mexico, Netherlands, Peru, Poland, Portugal, Romania, Russian Federation, South Korea, Spain, Switzerland, Taiwan, U.K., Ukraine, USA

9. Report submitted by: J.M. Girart

10. Date and place: Barcelona

11. Signature of SOC Chairperson: J. Alves, B. Elmegreen, J.M. Girart, V. Trimble

12. **Summary of the scientific highlights of IAU Symposium No. 270**

IAU Symposium 270 had its origins at the Fall 2008 JENAM meeting in Vienna, where three of the four present editors participated in a session on star formation that proved too short to clarify either all of the problems or what progress was being made on them. We decided that a larger meeting would be useful, particularly one with an emphasis on numerical simulations and comparisons with observations. Fortunately, the IAU executive committee agreed.

The conference has achieved the goals with a significant participation of astronomers from around the world (219 from 30 countries). Among the participants, we have a large group of internationally renowned astronomers, as well as many young talents. There were a total of about 80 talks and 130 posters. The talks were selected in order to cover most of the main topics of Star Formation, from individual star formation at disk scales to star formation at cosmological scales. A special emphasis was done to better understand the similarities and differences between computational techniques, as well as the recognition of the successes and shortcomings in matching the simulation results to detailed observations of star formation. The meeting was organized in the following sessions:

- Historical introduction
- Individual Star Formation: Observations
- Individual Star Formation: Theory
- Formation of Clusters: Observations
- Cluster Formation: Theory
- Numerical Methods: MHD
- Numerical Methods: Radiative Dynamics
- Local Star Formation Processes
- Star Formation Feedback
- Star Formation on Galactic Scales
- Novel technologies: Special purpose hardware
- Computational Methods
- Synthetic observations: Radiation diagnostics of star formation
- Large Scale Star Formation
- Cosmological Star Formation
- Computational Star Formation

Star formation is complex, involving unknown initial conditions and poorly understood physical processes, such as supersonic turbulence, magnetic diffusion and reconnection, radiation transfer of background and young stellar light, and cooling by collisional excitation and decay of transient molecules and dust particles, all operating in a medium with rapidly changing substructures spanning 20 orders of magnitude in density. It is a violent storm of collapse into filaments, clumps, disks, and protostars, with equally violent energy release in the form of jets, winds, and heat, plus ionization when the most massive stars appear. Yet viewed at various embedded stages through infrared, mm, and radio telescopes, the result of this activity is a fairly regular assortment of young stars and protostars, with a power law distribution of separations and a power law distribution of masses, both extending from the largest scales and masses down to minimum values where the motions become subsonic. By the time these stars are visible to the eye in the night sky, the process is mostly over, the dense gas has dispersed, the jets have calmed, and the dense young clusters have started to disperse.

What lies between the dispersed gas before star formation and the dispersed gas after star formation, minus the few percent that has turned into stars, is the concern of theoreticians and observers at this conference. After 50 years of exponential growth in the speed, storage, and capacity of computers, we are at a stage where many of the formerly unimaginable processes involved with star formation can be studied with some realism. These processes include cloud formation in galaxies, cloud turbulence and collapse, disk and binary star formation, pre-stellar

jets and winds, the effects of ionization, and star cluster evolution. Remarkably, simulators get about the same results as observers: power law structures and mass functions are reproduced in computers, filaments, clumps and disks are all present, the timescale for star formation comes out about right, and the overall efficiency of turning gas into stars is also right.

Still there are many details that need to be evaluated. In fact, the first two decades of simulations look almost too good in retrospect. When realistic heating and windy feedback are included, the stellar mass function sometimes changes in seemingly unacceptable ways. The full complexity of magnetic processes is not yet modeled either. Different magnetic field configurations could affect the binary fraction and disk sizes. Processes such as ion-molecule-radiation chemistry that determine the ionization fraction and rate of diffusion are not in computer codes, nor is magnetic reconnection. Radiative transfer through complex gas structures has barely begun. There is still a lot to do.

International Astronomical Union
Union Astronomique Internationale

POST MEETING REPORT FORM

for meetings other than Joint Discussions and Special Sessions

Deadline for Submission: within 1 month after the meeting

the following information should be sent to the IAU Assistant General Secretary

The following documents should be attached:

i Final Scientific Program

ii List of participants

iii List of recipients of IAU Grants, including amount and country

iv Receipts signed by the recipients of IAU Grants (This does not apply to Scientific Meetings held during General Assemblies)

v Brief report (text.txt file or word.doc) to the Executive Committee on the scientific highlights of the meeting (1-2 pages)

1. Meeting Number: IAU Symposium 271

2. Meeting Title: Astrophysical Dynamics: from Stars to Galaxies

3. Coordinating Division: Division IV

4. Dedication of meeting (if any): to Professor Juri Toomre

5. Location (city, country): Nice, France

6. Dates of meeting: 06/21-06/25/2010

7. Number of participants: 120

8. List of represented countries: France, Germany, USA, UK, Italy, Spain, Portugal, Belgium, South Africa, Japan, Iran, Austria, Sweden, Canada, Hong Kong, China, Danemark,Turkey,Australia, India, Israel, Ukraine, Finland, Egypt, Algeria, Mexico, Lebanon, Netherland, Argentina

9. Report submitted by: A.S. Brun

10. Date and place: Saclay, 02/09/2011

11. Signature of SOC Chairperson:

Final Scientific Report for the IAU Symposium 271
Astrophysical Dynamics: From Stars to Galaxies

We live in a dynamic Universe. Wherever we point our ground-based or space-born telescopes, we see clear evidence of intricate, multi-scale, time-dependent phenomena. The Sun exhibits intense convective and magnetic activity that impacts the entire heliosphere, including our own planet Earth. Other stars, whether they are being formed, live on the main sequence or are on the verge of dying, likewise show intense activity, and the most massive ones die in tremendous energetic events. Their host galaxies are equally active and dynamic. Throughout their formation and subsequent evolution they may undergo dramatic mergers, create and destroy bars, accrete from surrounding cosmological filaments or emit powerful jets detectable as radio lobes. These phenomena and many others occurring in the cosmos undeniably demonstrate that in order to understand our Universe, astronomers in the 21st century must face the complexity of nonlinear dynamical systems head-on with multi-wavelength, multi-scale observations, sophisticated theoretical models, and high-resolution numerical simulations on modern high-performance computing platforms.
This is a very challenging task, but thanks to the universality of the laws of physics and to common fundamental physical processes at work in most astronomical objects, such as gravity, turbulence, mixing, magnetism, dynamo action and dynamical instabilities, progress can be made by appealing to a comprehensive theoretical framework.
Astrophysical dynamics, which encompasses astrophysical fluid dynamics, clearly constitutes such a framework and has already led to substantial progress in modern astronomy. To list just a few notable achievements, we are now able to model the convective layers of stars and their large-scale differential rotation, to describe aspects of the formation of stars and the dynamics of accretion disks and jets, to study the formation of bars and density waves in galaxies, and to simulate galactic mergers. Still, many fundamental challenges remain, such as elucidating the ultimate origins of the 22-year solar activity cycle, the stellar initial mass function, and the bi-modal galaxy color distribution. How do subtle nonlinear interactions among gravitation, magnetism, and inertia give rise to such a diversity of observed phenomena?

In this final report of the IAU Symposium on "*Astrophysical Dynamics: From Stars to Galaxies"* we are pleased to say that we were able to bridge the gap between stars and galaxies, emphasizing commonalities in physical processes, observational techniques and modelling strategies. All the leading experts in solar and stellar physics, galaxy structure and evolution, astrophysical fluid dynamics, and dynamical systems theory, have made a tremendous effort to improve our understanding of complex astrophysical systems and in particular, to educate and inspire young scientists, preparing them for the challenges that lie ahead. The technical issues were addressed in all fields from dynamo to galaxy mergers. In this symposium researchers have interacted directly and compared their methods and approaches since in many cases they are solving the same equations. Thanks to many discussion sessions (twice a day + questions time at the end of each talk), dedicated poster sessions and coffee break near the poster room and a common lunchroom on the 7th floor of the Grand Aston Hotel, ample time has been allocated to such interdisciplinary exchanges in order to promote cross-fertilization.

Please visit the conference web site: http://irfu.cea.fr/Projets/IAUSymp271

Final Program for Symposium: Astrophysical Dynamics: From Stars to Galaxies

Monday 21st of June 2010
9:00 - 9:30 Conference welcome

The Sun and Stars: observational constraints, theories and models
9:30 - 10:15 Invited Lecture: J.-P. Zahn "Juri and the art of modelling convection zones"
10:15 - 10:35 Contributed Talk: F. Hill "Helioseismic observations of solar convection zone dynamics"
10:35 - 10:55 Contributed Talk: B. Hindman "Using eigen fct phases to measure deep meridional circulation"
10:55 - 11:20 25 min Coffee Break + Posters
11:20 - 11:50 Invited Talk: J.F. Donati "Magnetic fields of low-mass stars: the many faces of dynamo"
11:50 - 12:20 Invited Talk: S. Tsuneta "Solar Magnetism as revealed by Hinode satellite"
12:20 - 12:50 Discussion

12:50 - 14h30 Lunch Break at the hotel (included in conference fees)

14:30 - 15:15 Invited Lecture: D. O. Gough "Some recent and future helioseismological inferences about the solar convection zone"
15:15 - 15:45 Invited Talk: J. Christensen-Dalsgaard "Stellar hydrodynamics caught in the act: asteroseismology with CoRoT and Kepler"
15:45 - 16:05 Contributed Talk: M.S. Miesch "Probing Solar Internal Dynamics with Numerical Simulations"
16:05 - 16:30 25 min Coffee Break + Posters
16:30 - 17:00 Invited Talk: Alan Title "Magnetic Fields and Convection - A chicken and egg problem"
17:00 - 17:20 Contributed Talk: M. Thompson "Asteroseismic results for the evolved solar-type star KIC 11026764 (Gemma)"
17:20 - 17:40 Contributed Talk: M. DeRosa "The Evolving Photospheric Magnetic Field: A Spherical Harmonic."
17:40 - 18:30 General Discussion led by J.-P. Zahn & D. O. Gough

Tuesday 22nd Galaxies: observational constraints, theories and models

9:30 - 10:15 Invited lecture: A. Toomre "TT72 and later developments"
10:15 - 10:35 Contributed Talk: Yu-Ting Wu "On the formation of ring galaxies"
10:35 - 10:55 Contributed Talk: J. Wolf "Modeling mass independent of anisotropy: a new advancement in galactic dynamics"
10:55 - 11:20 25 min Coffee Break + Posters
11:20 - 11:50 Invited Talk: F. Combes "Galaxy dynamics: secular evolution and hierarchical scenario"
11:50 - 12:10 Contributed Talk: P. Repetto "Pair galaxy observations with PUMA"
12:10 - 12:50 Discussion

12:50 - 14:30 Lunch Break at the hotel (included in conference fees)

14:30 - 15:15 Invited Lecture: E. Zweibel "Origin and Evolution of Galactic Magnetic Fields "
15:15 - 15:35 Contributed Talk: A. Curir "N-body simulations of the formation of the galactiv stellar halo"
15:35 - 15:55 Contributed Talk: R. Levine "Large-dynamic range simulations of a galaxy hosting a supermassive black hole"
15:55 - 16:20 25 min Coffee Break + Posters
16:20 - 16:50 Invited Talk: F. Bournaud "Gas dynamics and star formation in galaxy collisions"
16:50 - 17:20 Invited Talk: K. Ferriere "Interstellar magnetic fields near the Galactic center"
17:20 - 18:20 General Discussion led by A. Toomre & E. Zweibel

Wednesday 23rd Nonlinear Astrophysics

9:00 - 9:45 Invited Lecture: U. Frisch "Doubly curl-free flows and MAK reconstruction"
9:45 - 10:05 Contributed Talk: H. Muthsam "Simulations of stellar convection, pulsation and semiconvection"
10:05 - 10:35 Invited Talk: P. Padoan "From turbulence to star formation"
10:35 - 10:55 Contributed Talk: P. Bushby "Influence of stratification upon small scale convectively-driven dynamos"
10:55 - 11:20 25 min Coffee Break + Posters
11:20 - 11:50 Invited Talk: D. Hughes "Self-consistent mean field MHD "
11:50 - 12:10 Contributed Talk: D. Arnett "Convection in stars: a new perspective"
12:10 - 13:00 General Discussion led by D. Hughes
13:00 - 14h30 Lunch Break at the hotel (included in conference fees)

Free Afternoon / Social Event boat trip: departure by bus at 14:30
19:30 - 22:30 Conference Dinner

Thursday 24th Cosmic Magnetism
9:30 - 10:15 Invited Lecture: H.K. Moffatt "Some topological considerations in relation to cosmic magnetism "
10:15 - 10:35 Contributed Talk: R. Arlt "Dynamo effect from Tayler instability in stellar radiative zone"
10:35 - 10:55 Contributed Talk: L. Silvers "Double diffusive magnetic buoyancy instability"
10:55 - 11:20 25 min Coffee Break + Posters
11:20 - 11:50 Invited Talk: C. Parnell "3 dimensional magnetic reconnection"
11:50 - 12:20 Invited Talk: M. Proctor "Large scale dynamo action influenced by velocity shear and convection"
12:20 - 12:50 Discussion

12:50 - 14h30 Lunch Break at the hotel (included in conference fees)

14:30 - 15:15 Invited Lecture: N. O. Weiss "Solar and stellar dynamos"
15:15 - 15:35 Contributed Talk: B. Brown "Global scale dynamos in stellar convection zones"
15:35 - 15:55 Contributed Talk: S. Mathis "MHD relaxation of fossil magnetic fields in stellar interiors"
15:55 - 16:20 25 min Coffee Break + Posters
16:20 - 16:50 Invited Talk: A. Brandenburg "From large-scale dynamos to magnetic helicity"
16:50 - 1710 Contributed Talk: L. Jouve "Magnetic buoyancy as an origin of the solar cycle variability"
17:10 - 17:40 Invited Talk: D. Galloway "Nonlinear Dynamos"
17:40 - 18:40 General Discussion led by H.K. Moffatt & N. O. Weiss

Friday 25th Astrophysical Turbulence
9:30 - 10:15 Invited Lecture: A. Pouquet "Selected issues in MHD turbulence, and how to cope with them"
10:15 - 10:35 Contributed Talk: T. Rogers "2.5D simulations of the solar radiative interior"
10:35 - 10:55 Contributed Talk: M. Browning "Rotation and magnetism in fully convective stars"
10:55 - 11:20 25 min Coffee Break + Posters
11:20 - 11:50 Invited Talk: B. Dubrulle "Dynamo in Turbulent fluids: Theory and Experiments "
11:50 - 12:20 Invited Talk: C. Forest "A plasma dynamo experiment and laboratory tests of solar dynamo processes"
12:20 - 12:50 Discussion led by A. Pouquet

12:50 - 14h15 Lunch Break at the hotel (included in conference fees)

14:15 - 14:45 Invited Talk: K. Chan "Overshooting above a convective zone"
14:45 - 15:15
Invited Talk: S. Tobias "Astrophysical fluids via cumulant expansions"
15:15 - 15:40 25 min Coffee Break + Posters
15:40 - 16:30 Remarks and Prospectives: J. Toomre
End of Symposium

More specifically we have addressed the following subjects:

- The Sun and stars:

The Sun is an enigmatic star, and its proximity allows us to obtain accurate high-resolution observations of its multi-scale dynamics. It is an incredible challenge to explain the latest findings of satellites such as SoHO, Hinode and Stereo, such as torsional oscillations and fluctuating meridional flows, flux emergence at all scales from bright points up to active regions, seething horizontal fields in the solar photosphere, fast reconnection and the dynamic corona. Other low mass stars also demonstrate intense activity as revealed by observational proxies such as soft X-ray emission. The general understanding of such activity is linked to their convective envelopes and coronae, although a detailed description is still forthcoming. Further, all stars rotate, and differential rotation and meridional circulation play a key role in their overall dynamics.

Observational constraints: helio and asteroseismology, magnetism and abundances

One way of assessing solar and stellar dynamics is through helio- and asteroseismology. These indirect techniques have allowed us to infer the sound speed, density and angular velocity profiles of the Sun. Progress is being made on the meridional circulation and for detecting gravity modes. For more distant stars, thanks to Corot and soon Kepler, the depth of the star's convection zone and radial profiles of key quantities (density, sound speed, preliminary rotation profile) are starting to be inferred. Mode identification is crucial in order to progress in probing the interior of stars since both fast rotation and strong magnetic fields can lead to mode mixing and overlapping. Observations of the magnetic activity and rotation profiles are also very important and instruments such as the spectropolarimeter Espadons are achieving important breakthrough. Abundance anomalies (such as the Lithium depletion in solar type stars or overabundance of rare earths in chemically peculiar stars) often indicate that a dynamical process is at work. Such observations serve to guide and constrain theoretical models.

- Galaxies:

Galaxies are complex dynamical objects subject to both the gravitational forces of stars and dark matter and the influence of rotation. Their shape (elliptic or spiral) is the result of nonlinear evolution, mergers and interactions with the cold gas in the cosmic filaments in which they are embedded. Filament accretion in particular supplies fresh fuel that can trigger star bursts, promote the generation of bars, and feed active galactic nuclei (AGN). Galaxies possess both a disorganized magnetic field and a large-scale field of about a microgauss, and it is unclear how such a strong magnetic field is maintained. Understanding the internal nonlinear dynamics of galaxies, as well as their interactions, is crucial for a better comprehension of the large-scale evolution of the Universe.

Observational constraints: dynamics, magnetism and abundances

In galaxies the chemical composition and the abundance of gas are as crucial to assessing their evolutionary stage as is their stellar population. The observation of large-scale magnetic fields through Faraday rotation for instance, places strong constraints on the galactic dynamo. Rotation curves are also important in order to assess the dynamical role of the galactic halo. Such observations serve to both guide and constrain theoretical models of internal galactic dynamics.

- Nonlinear Astrophysics

The vast range of dynamical scales and nonlinear physical processes operating in both stars and galaxies poses a formidable challenge from a modelling perspective. High-resolution numerical simulations and dynamical systems theory have become essential tools to enable further progress, fuelled by continuing advances in high-performance computing technology and constrained by ongoing astronomical observations.

Astrophysical Turbulence, Convection, Rotation and Shear

Describing and understanding turbulence remains one of the most challenging problems in fluid dynamics and indeed, astrophysics. As a consequence of the extremely high Reynolds numbers that characterize them (due mostly to their large size), astrophysical objects are generally highly turbulent. Whether dealing with stars or galaxies, astronomers are continually confronted with the formidable task of characterizing isotropic or more generally, anisotropic turbulence, frequently driven or accompanied by thermal convection and rotational shear. International conferences provide a unique opportunity to promote a more comprehensive understanding of such a complex and ubiquitous nonlinear phenomenon.

Astrophysical Dynamos, MHD and instabilities

Magnetic fields are found in most celestial objects, since the most common state of matter in the Universe is ionised gas, i.e. plasmas. Like turbulence, magnetic fields play a key role in determining the evolution of many cosmic objects. Magnetism may trigger instabilities and mixing, may promote or inhibit the formation of complex structures, may power eruptive events such as coronal mass ejections and X-ray flares, and may apply large scale torques; in any case it is clear that understanding and describing magnetic fields, including their origin and topology, is of utmost importance for a complete vision of our dynamical Universe.
Directly connected to the existence of magnetic fields in the Universe is dynamo action. This fundamental process explains how magnetic fields can be maintained for long times against Ohmic dissipation. Understanding the subtle interplay between flows and magnetic fields leading to successful dynamo action is key to a better description of cosmic magnetism.

Final participants list :

Arlt	Rainer	Astrophysikalisches Institut Potsdam
Arnett	David	Steward Observatory
Arter	Wayne	CCFE
Augustson	Kyle	JILA University of Colorado Boulder
BESSOLAZ	Nicolas	CEA Saclay DSM/IRFU/SAp
BIGOT	lionel	Observatoire de la Côte d'Azur
Barker	Adrian	DAMTP, University of Cambridge
Brun	Allan Sacha	CEA SAclay
Bournaud	Frederic	CEA Saclay
Brandenburg	A.	
Brown	Benjamin	University of Wisconsin
Browning	Matthew	Canadian Institute for Theoretical Astrophysics (CITA)
Brummell	Nicholas	University of California Santa Cruz
Bushby	Paul	Newcastle University
CAI Tao	Tao	Hong Kong University of Science and Technology
COMBES	Francoise	Observatoire de Paris
Candelaresi	Simon	Nordita, Stockholm
Capaccioli	Massimo	University of Naples, Federico II
Cemeljic	Miljenko	Academia Sinica Institute of Astronomy and Astrophysics
Chan	Kwing	Hong Kong University of Science et Technology
Chatterjee	Piyali	NORDITA
Christensen-Dalsgaard	J.	
Collet	Remo	Max Planck Institute for Astrophysics
Culetu	Hristu	Ovidius University
Curir	Anna	INAF- Astronomical Observatory of Torino - Italy
DO CAO	Olivier	Université Paris 7 - Observatoire de Paris
Davies	Christina	University of Leeds
DeRosa	Marc	Lockheed Martin Solar and Astrophysics Laboratory
Del Sordo	Fabio	Nordita
Donati	JF	
Dr.A.B.Rajib Hazarika,PhD,MIAMP(Ger),FRAS(Lond)AES	Dr.A.B.Rajib	Diphu Govt. College,Diphu,Assam,India
Dubrulle	B.	
Engelbrecht	Chris	University of Johannesburg
Erkurt	Adnan	Istanbul University, Department of Astronomy and Space Sciences
Ferrière	Katia	Observatoire Midi-Pyrénées
Forest	Cary	University of Wisconsin, Madison
Frescura	Fabio	University Witwatersrand
Frisch	U.	
Galloway	David	University of Sydney
Garaud	Pascale	UC Santa Cruz
Gazol	Adriana	CRyA, UNAM
Gough	Douglas	University of Cambridge

Griv	Evgeny	Ben-Gurion University
Groppen	Vitaly	North-Caucasian Institute of Mining and Metallurgy
Grouchy	Rebecca	l'Observatoire de Paris
Guerrero	Gustavo	NORDITA
Hartlep	Thomas	Hansen Experimental Physics Laboratory, Stanford University
Hill	Frank	National Solar Observatory
Hindman	Bradley	JILA / University of Colorado
Hubbard	Alexander	NORDITA
Hughes	David	University of Leeds
Hurlburt	Neal	Lockheed Martin Advanced Technology Center
Ismailov	Nariman	Baku State University
Izadi	Azam	Tehran University
Jalloh	Mohamed Salieu	Kuzey Yapim et Organization
Jouve	Laurene	DAMTP Cambridge UK
KRITSUK	Alexei	University of California, San Diego
KUMAR	NAGENDRA	M.M.H. College Ghaziabad, (U.P), India
Kaushik	Subhash Chandra	School of Studies in Physics, Jiwaji University
Kennedy	Gareth	Institut de Ciències del Cosmos, University of Barcelona
Kryvdyk	Volodymyr	Taras Shevchenko National University of Kyiv
Kulpa-Dybel	Katarzyna	Astronomical Observatory of the Jagiellonian University
LALOUM	MAURICE	ex - CNRS/IN2P3/LPNHE (retired)
Leibacher	John	National Solar Observatory
Levine	Robyn	Canadian Institute for Theoretical Astrophysics
Lin	Lien-Hsuan	Institute of Astronomy and Astrophysics, Academia Sinica (ASIAA)
Lindborg	Marjaana	University of Helsinki
Lobanova	Olga	
Mathis	Stéphane	CEA/DSM/IRFU/SAp/LDEE AIM Paris-Saclay
Meyrand	romain	IAS
Miesch	Mark	High Altitude Observatory, NCAR
Moffatt	KH	
Mohammadpour	motahareh	mazandaran university
Muthsam	Herbert J.	Faculty of Mathematics, University of Vienna
Ntormousi	Evangelia	University Observatory Munich
Olczak	Christoph	Max Planck Institute for Astronomy
PANIVENI	paniveni	NIEIT, MYSORE, INDIA
Padoan	Paolo	ICREA / ICC - University of Barcelona
Parnell	Clare	University of St Andrews
Pasqua	Antonio	University of Manchester
Pinto	Rui	CEA Saclay, DSM/Irfu/SAP
Politano	Helene	Observatoire de la Côte d'Azur
Pouquet	Annick	NCAR
Proctor	Michael	DAMTP, University of Cambridge
Rahoma	W. A.	Astronomy Dept., Faculty of Science, Cairo University, Egypt
Regner	Trampedach	JILA, University of Colorado
Rempel	Erico	Institute of Aeronautical Technology (ITA)

Repetto	Paolo	Instituto de Astronomia UNAM (Mexico City, Mexico)
Rogers	Tamara	
Sahraoui	Fouad	Laboratoire de Physique des Plasmas, LPP/CNRS-Ecole Polytechnique
Schmitt	JH	
Schou	Jesper	Stanford University
Shevchenko	Ivan I.	Pulkovo Observatory of the Russian Academy of Sciences
Shravan Hanasoge	Shravan	Max-Planck Institute for Solar System Research
Silvers	Lara	City University London
Strugarek	Antoine	CEA DSM/IFRU/SAp Saclay
Tahereh	pourmirjafarifirozabadi	Azad University
Tanner	Joel	Yale University
Thompson	Michael	University of Sheffield
Title	Alan	Lockheed Martin Advanced Technology Center
Tobias	Steve	University of Leeds
Toomre	Juri	JILA et Department of Astrophysical and Planetary Sciences
Toomre	Alar	MIT
Torrelles	Jose-Maria	ICE(CSIC/IEEC)-UB
Tsuneta	Saku	National Astronomical Observatory of Japan
Van Marle	Allard Jan	K.U Leuven
Vasil	Geoffrey	Canadian Institute for Theoretical Astrophysics
WU	YU-TING	Department of Physics, National Tsing-Hua University, Hsinchu, Taiwan, ROC
Wang	Ling Jun	University of Tennessee at Chattanooga
Warnecke	Jörn	Nordita, Stockholm
Weiss	Nigel	University of Cambridge
Wolf	Joe	University of California, Irvine
Wood	Toby	UC Santa Cruz
Zahn	Jean-Paul	Observatoire de Paris
Zhukova	Olexandra	Obcervatory
Zubreva	Nataliya	Ukraine Observatory
Zweibel	Ellen	U. Wisconsin-Madison

Post Meeting Report IAUS 272

General informations

1. Meeting number: 272

2. Meeting title: Active OB stars; structure, evolution, mass-loss, and critical limits

3. Dedication of the meeting: None

4. Location: Paris, France

5. Dates of the meeting: July 19 to 23, 2010

6. Number of participants: 172

7. List of the 26 represented countries: Argentina, Belgium, Brazil, Canada, Chile, Colombia, Czech Republic, Estonia, France, Germany, Greece, India, Japan, Malaysia, Mexico, Netherlands, Poland, Russia, Spain, Sweden, Switzerland, South Africa, Taiwan, Ukraine, United Kingdom, United States of America

8. Report submitted by: Coralie Neiner

9. Date and place: Meudon, January 20, 2011

10. Signature of SOC Chairperson: Coralie Neiner

Final scientific program

Monday July 19

08:30-09:30 – Registration & putting up posters
09:30-10:00 – Welcome Coffee
10:00-10:15 – Coralie Neiner – Welcome address
10:15-11:00 – Dietrich Baade – Opening talk

Session 1: Rapid rotation and mixing in active OB stars

11:00-11:45 – Jean-Paul Zahn – Review: Physical processes
11:45-12:10 – Norbert Przybilla – Mixing of CNO-cycled matter in pulsationally and magnetically active massive stars

12:10-14:00 – Lunch

14:00-14:25 – Matteo Cantiello – Subsurface convection in OB stars
14:25-14:50 – Laura Penny – Rotation Rates of O-Type Stars in the Magellanic Clouds
14:50-15:35 – Ming Zhao – Review: Interferometric studies of rapid rotators
15:35-16:00 – Jose Groh – The effects of fast rotation on the wind of Luminous Blue Variables
16:00-16:30 – Coffee break
16:30-17:15 – Sylvia Ekstrm – Review: Massive stellar models: rotational evolution, metallicity effects
17:15-17:40 – Ines Brott – Rotational Mixing in Massive Stars, More Puzzling than Ever !
17:40-18:05 – Adrian Potter – Testing Models of Rotating Stars
18:05-18:35 – Discussion chaired by G. Meynet & G. Peters
18:35-19:00 – Group picture

20:00 – Welcome cocktail

Tuesday July 20

Session 2: Winds and magnetic fields of active OB stars

09:00-09:45 – Vronique Petit – Review: Observations of magnetic fields
09:45-10:10 – Gregg Wade – The MiMeS Project: Magnetism in Massive Stars
10:10-10:35 – Mary Oksala – Spectropolarimetric observations of the B2Vp star sigma Ori E
10:35-11:05 – Coffee break
11:05-11:30 – Thomas Rivinius – Closing in on the rapid magnetic rotator HR7355 (B2Vpn)
11:30-12:15 – Alex Fullerton – Review: Structure in the Winds of O-Type Stars: Observations and Inferences

12:15-14:00 – Lunch

14:00-14:45 – Rich Townsend – Review: Modeling the Winds and Magnetospheres of Active OB Stars
14:45-15:10 – Stephane Mathis – Dynamics of fossil magnetic fields in massive stars interior
15:10-15:35 – Oleg Kochukhov – Magnetic Doppler imaging of early-type stars
15:35-16:05 – Discussion chaired by J.-C. Bouret & L. Cidale
16:05-16:35 – Coffee break

Session 3: Populations of OB stars in galaxies

16:35-17:20 – Norbert Langer – Review: The elusive massive main sequence stars
17:20-17:45 – Thibault Decressin – Massive stars in globular clusters: drivers of chemical and dynamical evolution
17:45-18:30 – Chris Evans – Review: Populations of OB stars in galaxies

18:30-19:00 – Special delta Sco side discussion

21:00 – General Public Conference by Georges Meynet

Wednesday July 21

09:00-09:45 – Christophe Martayan – Review: Populations of Be stars: stellar evolution of extreme stars
09:45-10:10 – Alceste Bonanos – Infrared properties of Active OB stars in the Magellanic Clouds from the Spitzer SAGE Survey
10:10-10:40 – Coffee break
10:40-11:05 – Anatoly Miroshnichenko – The B[e] phenomenon in the Milky Way and Magellanic Clouds
11:05-11:30 – Dominik Bomans – Massive variable stars at very low metallicity?
11:30-12:00 – Discussion chaired by H. Saio & G. Wade

12:00 – Cultural outing

Thursday July 22

Session 4: Circumstellar environment of active OB stars

09:00-09:45 – Philippe Stee – Review: Observations of circumstellar disks
09:45-10:30 – Alex Carciofi – Review: The Circumstellar Disks of Be Stars
10:30-11:00 – Coffee break
11:00-11:25 – Christopher Tycner – Spatially Resolving the Wind and Disk Structures around Active B-type Stars
11:25-11:50 – Olivier Chesneau – High spatial resolution monitoring of the activity of BA supergiant winds
11:50-12:15 – David Cohen – X-ray Spectral Diagnostics of Activity in O and Early-B Stars

12:15-13:45 – Lunch

13:45-14:30 – Evelyne Alecian – Review: Activity of Herbig Be stars and their environment
14:30-14:55 – Chien-De Lee – Dust Formation of classical Be stars with Large Near Infrared Excess
14:55-15:20 – Kerstin Weis – Nebulae around Luminous Blue Variables - Large Bipolar Variety
15:20-15:50 – Discussion chaired by D. Gies & R. Townsend
15:50-16:20 – Coffee break

Session 5: Periodic variations and asteroseismology of OB stars

16:20-17:05 – Peter de Cat – Review: Asteroseismic observations of OB stars
17:05-17:30 – Andre-Nicolas Chene – Pulsations in Wolf-Rayet stars: observations with MOST

17:30-17:55 – Juan Gutierrez-Soto – Oscillations in Be stars seen by the CoRoT and Kepler space missions
17:55-18:40 – Marc-Antoine Dupret – Review: Asteroseismic modelling of OB stars
18:40-19:05 – Hideyuki Saio – Radial and nonradial pulsations of massive supergiants

20:00 – Symposium dinner

Friday July 23

09:00-09:45 – Hugues Sana – Review: The multiplicity of early-type stars
09:45-10:10 – Walter Van Rensbergen – Evolutionary models of binaries
10:10-10:40 – Discussion chaired by J. Fabregat & T. Rivinius
10:40-11:10 – Coffee break

Session 6: 'Normal' and active OB stars as extreme condition test beds

11:10-11:55 – Joachim Puls – Review: OB-stars as extreme condition test beds
11:55-12:20 – Maria-Fernanda Nieva – Fundamental parameters of normal B stars in the solar neighborhood

12:20-14:00 – Lunch

14:00-14:45 – Nathan Smith – Review: Eruptive outflow phases in massive stars
14:45-15:10 – Guillaume Dubus – Massive stars at very high energies: gamma-ray binaries
15:10-15:40 – Coffee break
15:40-16:05 – Stan Owocki & Atsuo Okazaki – Modeling TeV gamma-rays from LS5039: an Active OB Star at the Extreme
16:05-16:35 – Discussion chaired by M. Gagne & E. Janot-Pacheco
16:35-17:20 – Andre Maeder – Closing talk
17:20-17:30 – Coralie Neiner – Farewell and goodbye

List of participants

1	Nazhatulshima **Ahmad**	University of Malaya, Malaysia
2	Yael **Aidelman**	Universidad Nacional de La Plata, Argentina
3	Evelyne **Alecian**	LAOG, France
4	Ashley **Ames**	Central Michigan University, USA
5	Kalju **Annuk**	Tartu Observatory, Estonia
6	Matthew **Austin**	UCL, UK
7	Dietrich **Baade**	ESO-Garching, Germany
8	Daniela **Barria**	Universidad de Concepcion, Chile
9	Elena **Barsukova**	Special Astrophysical Observatory, Russia
10	Bertrand **de Batz**	Observatoire de Paris-Meudon – GEPI, France
11	Philippe **Bendjoya**	Lab. H. Fizeau -UNS-OCA, France
12	David **Bohlender**	National Research Council of Canada, Canada
13	Dominik **Bomans**	Astro. Inst. Ruhr-University Bochum, Germany
14	Alceste **Bonanos**	National Observatory of Athens, Greece
15	Jean-Claude **Bouret**	LAM, France & Goddard SFC, USA
16	Ines **Brott**	SIU, Netherlands
17	Matteo **Cantiello**	Argelander Institute for Astronomy, Germany
18	Alex **Carciofi**	Universidade de Sao Paulo, Brazil
19	Peter **de Cat**	Royal Observatory of Belgium, Belgium
20	André-Nicolas **Chene**	National Research Council - HIA, Canada
21	Olivier **Chesneau**	Observatoire de la Cote Azur, France
22	Lydia **Cidale**	Instituto de Astrofisica La Plata, Argentina
23	François **Cochard**	Shelyak Instruments, France
24	David **Cohen**	Swarthmore College, USA
25	Alicia **Cruzado**	FCAGLP, UNLP, Argentina
26	Michel **Cure**	Departamento de Fisica y Astronomia, Chile
27	Augusto **Damineli**	IAG-USP, Brazil
28	Alexandre **David-Uraz**	Universite de Montreal, Canada
29	Jonas **Debosscher**	Instituut voor Sterrenkunde-KULeuven, Belgium
30	Thibaut **Decressin**	Argelander-Institut für Astronomie, Germany
31	Omar **Delaa**	Observatoire de la Cote dAzur, France
32	Armando **Domiciano de Souza**	Observatoire de la Cote d Azur, France
33	Zachary **Draper**	University of Washington, USA
34	Guillaume **Dubus**	LAOG, France
35	Vincent D**uez**	Argelander-Institut für Astronomie, Germany
36	Paul **Dunstall**	Queens University Belfast, UK
37	Marc-Antoine **Dupret**	Université de Liège, Belgium
38	Michelle **Edwards**	Gemini Observatory, Chile
39	Sylvia **Ekström**	Geneva Observatory, Switzerland
40	Chris **Engelbrecht**	University of Johannesburg, South Africa
41	Francisco **Espinosa Lara**	Observatoire de Paris-Meudon – GEPI, France
42	Christopher **Evans**	UK ATC, UK
43	Nancy Remage **Evans**	SAO, USA

44	Juan **Fabregat**	Universidad de Valencia, Spain
45	Rémi **Fahed**	Université de Montréal, Canada
46	Michèle **Floquet**	Observatoire de Paris-Meudon – GEPI, France
47	Chloé **Fourtune-Ravard**	Univ Paris 7, France & RMC Canada, Canada
48	Fabio **Frescura**	U Witwatersrand, South Africa
49	Alex **Fullerton**	Space Telescope Science Institute, USA
50	Marc **Gagné**	West Chester University, USA
51	Alejandro **García Varela**	Universidad de los Andes, Colombia
52	Miriam **Garcia**	Instituto de Astrofisica de Canarias, Spain
53	Cyril **Georgy**	Geneva Observatory, Geneva University, Switzerland
54	Douglas **Gies**	Georgia State University, USA
55	Mélanie **Godart**	ASTA, University of Lige, Belgium
56	Vitaly **Goranskij**	Sternberg Astron. Inst., Moscow, Russia
57	Anahí **Granada**	Instituto de Astrofísica La Plata, Argentina
58	Jose **Groh**	Max-Planck-Institute for Radioastronmy, Germany
59	Erika **Grundstrom**	Vanderbilt University, USA
60	Jason **Grunhut**	Royal Military College of Canada, Canada
61	JUan **Gutiérrez-Soto**	IAA, Spain
62	Robbie **Halonen**	The University of Western Ontario, Canada
63	Xavier **Haubois**	Universidade de Sao Paulo-IAG, Brazil
64	Huib **Henrichs**	University of Amsterdam, Netherlands
65	Artemio **Herrero**	Instituto de Astrofisica de Canarias, Spain
66	Anthony **Herve**	Université de Liège, Belgium
67	Mohammad **Heydari-Malayeri**	Paris Observatory, France
68	Nicholas **Hill**	University of Wisconsin-Madison, USA
69	Wenjin **Huang**	University of Washington, USA
70	Anne-Marie **Hubert**	Observatoire de Paris-Meudon – GEPI, France
71	Robert **Izzard**	Argelander-Institut für Astronomie, Germany
72	Eduardo **Janot-Pacheco**	IAG - USP, Brazil
73	Andressa **Jendreieck**	IAG - USP, Brazil
74	Carol **Jones**	The University of Western Ontario, Canada
75	Alexander **Kholtygin**	Saint-Petersburg University, Russia
76	Oleg **Kochukhov**	Uppsala University, Sweden
77	Gloria **Koenigsberger**	Instituto de Ciencias Fisicas, UNAM, Mexico
78	Daniela **Korcakova**	Astronomical Institute AVCR, Czech Republic
79	Pavel **Koubsky**	Astronomical Institute, Ondrejov, Czech Republic
80	Evgenia **Koumpia**	University of Athens, Greece
81	Jiri **Krticka**	Masaryk University, Czech Republic
82	Paul **KT**	Christ University, India
83	Astrid **Lamberts**	LAOG, France
84	Norbert **Langer**	Argelander-Institut fuer Astronomie, Germany
85	Chien-De **Lee**	IANCU, Taiwan
86	Daniel **Lennon**	ESA - STScI, USA
87	Bernard **Leroy**	Observatoire de Paris-Meudon – LESIA, France
88	Alex **Lobel**	Royal Observatory of Belgium, Belgium

89	Catherine **Lovekin**	LESIA, Observatoire de Paris, France
90	André **Maeder**	Geneva Observatory, Switzerland
91	Laurent **Mahy**	University of Lige, Belgium
92	Vitalii **Makaganiuk**	Uppsala University, Sweden
93	Paula **Marchiano**	Fac. Cs. Astronómicas y Geofísicas, Argentina
94	Kostas **Markakis**	University of Athens, Greece
95	Amber **Marsh**	Lehigh University, USA
96	Christophe **Martayan**	ESO, Chile
97	Olga **Martins**	Observatoire de Paris-Meudon – GEPI, France
98	Derck **Massa**	STScI, USA
99	Stéphane **Mathis**	CEA DSM IRFU SAp, France
100	Meghan **McGill**	The University of Western Ontario, Canada
101	Ginny **McSwain**	Lehigh University, USA
102	Anthony **Meilland**	Max-Planck Institut für RadioAstronomie, Germany
103	Georges **Meynet**	Geneva Observatory, Switzerland
104	Gabriela **Michalska**	Wroclaw University, Poland
105	Florentin **Millour**	MPIFR, Germany
106	Selma **de Mink**	Astronomical Institute Utrecht, Netherlands
107	Anatoly **Miroshnichenko**	University of North Carolina Greensboro, USA
108	Sashin **Moonsamy**	University of the Witwatersrand, South Africa
109	Thierry **Morel**	University of Liège, Belgium
110	Yuuki **Moritani**	Kyoto University, Japan
111	Maria **Muratore**	Univ. Nacional de La Plata, Argentina
112	Gérard **Muratorio**	OAMP LAM, France
113	Yael **Naze**	Dept AGO, Université de Lège, Belgium
114	Coralie **Neiner**	Observatoire de Paris-Meudon – GEPI, France
115	Maria-Fernanda **Nieva**	Max Planck Institute for Astrophysics, Germany
116	Annick **Oger**	Observatoire de Paris-Meudon – GEPI, France
117	Atsuo **Okazaki**	Hokkai-Gakuen University, Japan
118	Mary **Oksala**	University of Delaware, USA
119	Finny **Oktariani**	Hokkaido University, Japan
120	Rene **Oudmaijer**	University of Leeds, UK
121	Stan **Owocki**	University of Delaware, USA
122	Laura **Penny**	College of Charleston, USA
123	Antonio **Pereyra**	Observatonio Nacional, Brazil
124	Brenda **Perez-Rendon**	DIFUS, Universidad de Sonora, Mexico
125	Geraldine **Peters**	University of Southern California, USA
126	Véronique **Petit**	Royal Military College of Canada, Canada
127	Jan **Polster**	Astronomical institute AV CR, Czech Republic
128	Adrian **Potter**	University of Cambridge, UK
129	Raman **Prinja**	University College London, UK
130	Norbert **Przybilla**	Dr. Remeis Obs. Bamberg, Germany
131	Joachim **Puls**	Observatory, University Munich, Germany
132	Gregor **Rauw**	Liége University, Belgium
133	Daniel **Reese**	LESIA, Observatoire de Paris, France

134	Thomas **Rivinius**	ESO Chile, Chile
135	Jose **Ricardo Rizzo**	Centro de Astrobiologia, Spain
136	Rachael **Roettenbacher**	Lehigh University, USA
137	Christopher **Russell**	University of Delaware, USA
138	Beatriz **Sabogal**	Universidad de los Andes, Colombia
139	Hideyuki **Saio**	Tohoku University, Japan
140	Hugues **Sana**	Astronomical Institute Anton Pannekoek, Netherlands
141	Gail **Schaefer**	CHARA Array of Georgia State University, USA
142	Romain **Selier**	LERMA - Observatoire of Paris, France
143	Thierry **Semaan**	Observatoire de Paris Meudon, France
144	Matthew **Shultz**	Queens University, Canada
145	Aaron **Sigut**	The University of Western Ontario, Canada
146	Sergio **Simon-Diaz**	Instituto de Astrofisica de Canarias, Spain
147	Myron **Smith**	Catholic University of America, USA
148	Nathan **Smith**	UC Berkeley, USA
149	Philippe **Stee**	Observatoire de la Cote d Azur - CNRS, France
150	Stanislav **Stefl**	European Southern Observatory, Chile
151	Vladimir **Strelnitski**	Maria Mitchell Observatory, USA
152	Brankica **Surlan**	Astronomical Institute Ondrejov, Czech Republic
153	Mairan **Teodoro**	IAG-USP, Brazil
154	Olivier **Thizy**	Shelyak Instruments, France
155	Yamina **Touhami**	Georgia State University, USA
156	Richard **Townsend**	University of Wisconsin-Madison, USA
157	Christopher **Tycner**	Central Michigan University, USA
158	Rodolfo **Vallverdú**	Observatorio Astronómico de La Plata, Argentina
159	Walter **Van Rensbergen**	Vrije Universiteit Brussel, Belgium
160	Brian **Van Soelen**	University of the Free State, South Africa
161	Jorick **Vink**	Armagh Observatory, UK
162	Delia **Volpi**	Royal Observatory of Belgium, Belgium
163	Viktor **Votruba**	Astronomical Institute AV CR, Czech Republic
164	Gregg **Wade**	Royal Military College of Canada, Canada
165	Kerstin **Weis**	Astr. Inst. Ruhr-University-Bochum, Germany
166	John **Wisniewski**	University of Washington, USA
167	Ruslan **Yudin**	Pulkovo Observatory, Russia
168	Jean-Paul **Zahn**	Observatoire de Paris, France
169	Ming **Zhao**	Jet Propulsion Lab, USA
170	Oleksandra **Zhukova**	Kiev Observatory, Ukraine
171	Jean **Zorec**	Institut d'Astrophysique de Paris, France
172	Nataliya **Zubreva**	Kiev Observatory, Ukraine

List of recipients of IAU grants

Name	Nationality	Grant (euros)
Ashley Ames	American	800
Matthew Austin	English	340
Elena Barsukova	Russian	500
Alceste Bonanos	Greek	400
Alex Carciofi	Brazilian	600
Alicia Cruzado	Argentinian	600
Michel Cure	Chilean	500
Alexandre David Uraz	Canadian	680
Zachary Draper	American	700
Remi Fahed	French	680
Erika Grundstrom	American	800
Jason Grunhut	Canadian	700
Juan Gutierrez-Soto	Spanish	800
Xavier Hautbois	French	280
Alexander Kholtygin	Russian	500
Evgenia Koumpia	Greek	800
Koustantinos Markakis	Greek	680
Anatoly Miroshnichenko	American	280
Maria Muratore	Argentinian	800
Ahmad Nazhatulshima	Malaysian	900
Mary Oksala	American	800
Antonio Pereyra	Peruvian	800
Veronique Petit	Canadian	900
Joachim Puls	German	600
Matthew Shultz	Canadian	700
Myron Smith	American	280
Christopher Tycner	American	700
Rodolfo Vallverdu	Argentinian	700
Ruslan Yudin	Russian	500
29 persons	13 nationalities	18320 euros

Brief report to the Executive Committee on the scientific highlights of the meeting

The IAU Symposium 272 has been a great success thanks to the participation of many researchers from 26 different countries and various fields of research in the domain of active OB stars. The program including both complete long reviews by experts and shorter talks on very new results often presented by young researchers has been very much appreciated. Discussions held at the end of each thematic session have been active and fruitful. Among the many highlights of the symposium, one could mention the following examples:

1. The observation of magnetic fields in massive stars is a recent domain of research that already provided important results, in particular thanks to the MiMeS project. The magnetic fields of OB stars are rare, internally strong, organized and show no correlation with stellar properties. Only a few percents of massive stars show magnetic fields with intensity at the surface larger than 300 G.

2. Important progress has also been made on the theoretical and numerical side in the field of magnetism. For example, the η_* parameter, which describes the magnetic confinement of the wind, has been introduced and allows to classify magnetospheres. On the analytical side, the first stable configuration of fossile magnetic field has been determined.

3. Mass loss estimates depend on density or density squared, depending on the type of determinations used (e.g. radio and Hα estimates depend on density, while UV determinations depend on density squared). Indeed, the presence of clumping leads to large overestimates when based on radio and Hα data. Only X-ray spectroscopy allows to determine mass-loss rates without being affected by clumping.

4. There is a strong dependence of most properties of OB stars on the metallicity of their environment. For example, the lower the metallicity, (1) the lower the mass-loss rate, (2) the larger the projected rotational velocities, and (3) the more Be stars there are.

5. From the new LBV discovered, in particular in external galaxies, one can derive that the LBV phenomenon is not restricted to high metallicities. Morever, the lifetime of the LBV phase is much longer (2-5 10^5 years) than previously assumed. Thus the LBV phase may be the phase when most of the mass loss necessary to form WR stars occurs, solving the problem of WR star formation.

6. The advent of interferometry allows to study and model circumstellar discs in detail, for example around Be stars. Most disc properties are consistent with a viscous decretion disc (the size at various wavelengths, the thin opening angle, the small deviations from a Keplerian disc, the long term variations in the integral light and colors, etc), unless the disc is confined by a magnetic field.

7. The occurrence and strength of magnetic fields detected in Herbig Ae/Be stars is compatible with the fraction and properties of magnetic fields observed in Ap/Bp stars assuming flux conservation. Thus magnetic Herbig stars are probably the progenitors of Ap/Bp stars.

8. The launch of high-precision photometric space missions, such as MOST, CoRoT and Kepler, allows asteroseismic studies and bring many news facts concerning the interior of massive stars,

in particular about overshooting, semi-convection and rotational mixing.

9. The observation of a Be outburst by CoRoT showed the coincidence between the outburst and pulsation mode-enhancement. This correlation allows a giant step forward in the understanding of the Be phenomenon.

10. Recent IR spectro-interferometry allowed a better understanding of the geometrical structure of the environment of Herbig Ae/Be stars, as well as the origin of their winds.

International Astronomical Union
Union Astronomique Internationale

POST MEETING REPORT FORM

for meetings other than Joint Discussions and Special Sessions
Deadline for Submission: within 1 month after the meeting

the following information should be sent to the IAU Assistant General Secretary

1. **Meeting Number:** 273

2. **Meeting Title:** Physics of Sun and Star Spots

3. **Coordinating Division:** Commission 10 Solar Activity, Commission 25 Stellar Photometru and polarimetry.

4. **Dedication of meeting (if any):** Nil

5. **Location (city, country):** Ventura, California, USA

6. **Dates of meeting:** 22-26 August 2010

7. **Number of participants:** 130

8. **List of represented countries:** 17

Argentina, Belgium, China, Finland, France, Germany,
Greece, Hungary, Ireland, India, Italy, Russia, Turkey, UK, USA, Ukrainian, Uzbekistan.

9. **Report submitted by:** Debi Prasad Choudhary

10. **Date and place:** 02/09/2011

11. **Signature of SOC Chairperson:** debiprasad choudhary

12. **Scientific Program Summary:** 27 invited talks, 40 oral presentations, 50 poster posters

13: **Scientific rationale:** Scientific rationale can be found at
http://www.csun.edu/physicsandastronomy/IAUS273/.

14. **Supporting Agencies:** IAU, NSF (USA) Geoscience and Astronomy Division, NASA

15. Summary of Scientific Highlights: The goal of IAU Symposium 273 was to bring the solar and stellar astronomers together to discuss the developments in the field of sunspots and star spots. This collaboration would give an opportunity to extend the knowledge of sunspots to understand the unresolved observations of star spots. There were about half participants from both solar and stellar field. There was a vigorous interaction between these two communities leading to exchanges and new collaborations. There were three PhD thesis presentations. The followings are few highlights of the scientific results presented in the symposium.

(a) The magnetoconvection models show that the convective processes responsible for the complicated magnetic structure of the penumbra and the mechanisms leading to the driving of strong horizontal outflows in the penumbra (Evershed effect) as well as large scale outflows in the periphery of sunspots (moat flows). Strong horizontal outflows in the sunspot penumbra can be explained through a redistribution of kinetic energy preferring flows along the filaments.

(b) The sunspot 1 minute cadence line of sight magnetogram observation show prominent changes of magnetic flux contained in the flaring spot region. Except in one case, the observed limbward flux increases while diskward flux decreases rapidly and irreversibly after flares. These observational evidence provide strong support, either directly or indirectly, the photospheric magnetic fields must respond to coronal field restructuring and turn to a more horizontal state near the Polarity Inversion Layer after eruptions.

(c) The observations of stars in wide range of wavelength provide valuable information on stellar magnetic field. At the shortest wavelengths, Xrays arise from magnetically heated coronal plasma, and study of transient heating events provides constraints on coronal length scales and magnetic field strengths required to confine the coronal plasma. Xray line diagnostics provide newly used constraints on spatial scales, with a bias towards compact coronal loops. At the opposite end of the electromagnetic spectrum, radio observations diagnose the presence and action of accelerated particles in stellar atmospheres. The persistent nature of nonthermal stellar radio emission, in addition to transient events, points to both the global and localized nature of magnetic fields in stellar atmospheres.

(d) The recent study of the late Btype star HD 11753 with HgMn peculiarity revealed a fast dynamical evolution of chemical surface spots. This result implies a hitherto unknown process operating in late B-type stars with radiative envelopes.

(e) The long term sunspot observations in near IR wavelengths show a lot of scatter but at a barely significant level we see that smaller, brighter and magnetically weaker spots have appeared more frequently as time passes.

(f) The Ca II H imaging observations by the Hinode Solar Optical Telescope (SOT) have revealed that the chromosphere is extremely dynamic, especially around sunspots. Chromospheric ejections and jets are well observed in moat region around sunspots. Xray observations show frequent occurrence of microflaring activities around sunspots; small emerging flux or some type of moving magnetic features can be identified on the footpoints for half of microflares studied, but no clear magnetic activities are observed at footpoints even with SOT high spatial magnetorams.

(g) Active region studies shows that both tether cutting and breakout model result CMEs in different time scale.

IAU Symposium 273
Physics of Sun and Star Spots

Ventura, California USA

22-26 August 2010

Table of Contents

Acknowledgments

We would like to thank the following for their generous contributions:

International Astronomical Union (IAU)

National Air and Space Administration (NASA)

National Science Foundation (NSF)

California State University, Northridge (CSUN)*: College of Science and Mathematics;*

Graduate Studies, Research, and International Programs

Also thanks to the following for their time and energy:

Scientific Organizing Committee

Local Organizing Committee

Department of Physics & Astronomy, CSUN

San Fernando Observatory, CSUN

With special thanks to:

Angie Cookson (SFO) *for creating our website and program/abstract book*

John Hodgson II (CSUN) *for event planning and designing the IAU 273 Symposium logo*

Scientific Organizing Committee

Debi Prasad Choudhary (*co-chair*), *United States*
Klaus G. Strassmeier (*co-chair*), *Germany*
Carsten Decker, *Germany*
Oddbjorn Engvold, *Norway*
Siraj Hasan, *India*
Suzanne Hawley, *United States*
Z. Hongqi, *China Nanjing*
Cristina Mandrini, *Argentina*
Donald B. Melrose, *Australia*
Eric Priest, *United Kingdom*
Edward Rhodes, *United States*
T. Sakurai, *Japan*
Brigitte Schmeider, *France*
Ashoke K. Sen, *India*
Michal Sobotka, *Czech Republic*
Jan O. Stenflo, *Switzerland*
Karel van der Hucht, *Netherlands*
Haimin Wang, *United States*

Local Organizing Committee

Ana Cristina Cadavid (co-chair), *United States*
Debi Prasad Choudhary (co-chair), *United States*
Carole Arciero, *United States*
Gary Chapman, *United States*
Damian Christian, *United States*
Angela Cookson, *United States*
Jan Dobias, *United States*
John Hodgson II, *United States*
Debbie Klevens, *United States*
John Lawrence, *United States*
Dora Preminger, *United States*

Daily Schedule at a glance

Day/Date	*Activity*	*Time*	*Location**
Sunday, 22 August	Reception/Registration	1830 – 2030 hrs	Top of Harbor Room
Monday, 23 August	Breakfast/Registration	0730 hrs	Top of Harbor Room
	Session 1 (Sunspots)	0800 – 1000 hrs	“
	Coffee	1000 – 1020 hrs	“
	Session 2 (Sunspots)	1020 – 1220 hrs	“
	Lunch	1220 – 1340 hrs	On your own
	Session 3 (Star spots)	1340 – 1555 hrs	Top of Harbor Room
	Poster Session	1600 – 1800 hrs	San Miguel Room
Tuesday, 24 August	Breakfast/Registration	0730 hrs	Top of Harbor Room
	Session 1 (Star spots)	0800 – 1000 hrs	“
	Coffee	1000 – 1020 hrs	“
	Session 2 (Sunspots)	1020 – 1220 hrs	“
	Lunch	1220 – 1340 hrs	On your own
	Session 3 (Sunspots)	1340 – 1540 hrs	Top of Harbor Room
	Coffee	1540 – 1600 hrs	“
	Session 4 (Star spots)	1600 – 1800 hrs	“
Wednesday, 25 August	Breakfast/Registration	0730 hrs	Top of Harbor Room
	Session 1 (Sunspots)	0800 – 1000 hrs	“
	Coffee	1000 – 1020 hrs	“
	Session 2 (Sunspots)	1020 – 1220 hrs	“
	Lunch	1220 – 1340 hrs	On your own
	Session 3 (Star spots)	1340 – 1555 hrs	Top of Harbor Room
	Poster Session	1600 – 1800 hrs	San Miguel Room
	Banquet	1830 hrs	Top of Harbor Room

Thursday, 26 August	Breakfast	0730 hrs	Top of Harbor Room
	Session 1 (Star spots)	0800 – 1000 hrs	“
	Coffee	1000 – 1020 hrs	“
	Session 2 (Star spots)	1020 – 1220 hrs	“
	Lunch	1220 – 1340 hrs	On your own
	Session 3 (Meeting Summary)	1340 – 1540 hrs	Top of Harbor Room

Friday, 27 August	Mt. Wilson Trip	0800 – 1700 hrs	Meet in Lobby

Location

Top of the Harbor Ballroom – Top Floor

San Miguel Ballroom – Lobby Floor

Daily Speaker Schedule

(* = invited)

1. Monday, 23 August 2010: Origin of Magnetic Field

0730: Breakfast

Session 1.1 (0800 – 1000 hrs): Sunspots
Chair: Hasan Singh

0800 hrs	Eric Priest	*Cosmic Magnetic Fields in the Sun -- Outstanding Problems of Modern Times (Invited Review)**
0825 hrs	Matthias Rempel	*3D numerical MHD modeling of sunspots with radiation transport**
0850 hrs	Kiyoshi Ichimoto	*The Structure of the Sunspots**
0915 hrs	Haimin Wang	*Observational Evidence of Back-reaction on the Solar Surface Associated with Coronal Magnetic Restructuring in Solar Eruptions*
0930 hrs	Sanjiv Kumar Tiwari	*Helicity of the Solar Magnetic Field*
0945 hrs	Lucia Kleint	*Solar imaging spectropolarimetry with the combination of two Fabry-Pérot etalons and a grating spectrograph*

1000 – 1020 hrs: Coffee Break

Session 1.2 (1020 – 1220 hrs): Sunspots
Chair: Karel Schrijver

1020 hrs	Arnab Choudhuri	*Origin of Solar Magnetism**
1045 hrs	Jose Carlos del Toro Iniesta	*Diagnostics for spectropolarimetry and magnetography**
1110 hrs	Daniel Gomez	*Heating of coronal active regions**
1135 hrs	Fraser Watson	*The evolution of magnetic fields in sunspots during solar cycle 23*
1150 hrs	Jingxiu Wang	*Vector magnetic fields of superactive sunspot groups*
1205 hrs	Mikhail Demidov	*On the Manifestation in the Sun-as-a-Star Magnetic Field Measurements of the Quiet and Active Regions*

1220 – 1340 hrs: Lunch

Session 1.3 (1340 – 1555 hrs): Starspots
Chair: Klaus Strassemier

1340 hrs	Rachel Osten	*Oh! The Places You'll Go: Multi-wavelength Tracers of Stellar Magnetic Activity**
1405 hrs	Steven Saar	*Starspots, Cycles and Magnetic Fields**
1430 hrs)	Mark Giampapa	*The Evolution of Stellar Surface Activity and Possible Effects Involving Exoplanets**
1455 hrs	Jacquelynne Milingo	*Rotational Modulation, Shear, and Cyclic Activity in HII 1883*
1510 hrs	Alexander Brown	*Starspot Variability and Evolution from Modeling KEPLER Photometry of Active Late-type Stars*
1525 hrs	Sandra Jeffers	*The impact of starspots on low-mass planet detection around M dwarfs*
1540 hrs	Koen Kemel	*Effect of stratified turbulence on magnetic flux concentrations*

1600 – 1800 hrs: Poster Session

2. Tuesday, 24 August 2010: Nature of Surface and Subsurface Magnetic Field

Breakfast: 0730 hrs

Session 2.1 (0800 – 1000 hrs): Starspots
Chair: Mark Giampapa

0800 hrs	Antonino Francesco Lanza	*Stellar activity, differential rotation and exoplanets**
0825 hrs	Adriana Valio	*Study of stellar activity through transit mapping of starspots**
0850 hrs	Katalin Olah	*Time-series photometry and starspot properties**
0915 hrs	Nicholas Featherstone	*Exploring the Deep Convection and Magnetism of A-type stars*
0930 hrs	Heidi Korhonen	*Chemical spots and their dynamical evolution on the surface of late B-type stars with HgMn peculiarity*
0945 hrs	Zsolt Kovari	*Differential rotation on the young solar analogue V889 Herculis*

1000 – 1020 hrs: Coffee Break

Session 2.2 (1020 – 1220 hrs): Sunspots
Chair: Cristina Cadavid

1020 hrs	Matthew Penn	*Long-term Evolution of Sunspot Magnetic Fields**

1045 hrs	Rolf Schlichenmaier	*The formation of a sunspot penumbra**
1110 hrs	Laurent Gizon	*Subsurface structure of sunspots**
1135 hrs	Rudolf Komm	*Solar subsurface flows of active regions: flux emergence and flare activity*
1150 hrs	Marcelo Lopez-Fuentes	*Twist and writhe of δ-island active regions*
1205 hrs	Manolis K. Georgoulis	*Pre-Eruption Configuration in the Active-Region Solar Photosphere*

1220 – 1340 hrs: Lunch

Session 2.3 (1340 – 1555 hrs): Sunspots
Chair: J. Del Toro Iniesta

1340 hrs)	Valentin Martinez Pillet	*Evershed and moat flows: one and the same thing?**
1405 hrs	Hongqi Zhang	*Solar chromospheric magnetic field**
1430 hrs	Toshifumi Shimizu	*Magnetic field evolution of active regions and sunspots in connection with chromospheric and coronal activities**
1455hrs	Brigitte Schmieder	*Solar activity due to magnetic complexity of active regions*
1510 hrs	Sara F. Martin	*Relationships between the Chirality of Sunspots, Filament Channels and Filaments*
1525 hrs	Nadezhda Zolotova	*Nature of the unusually long solar cycles*

1540 – 1600 hrs: Coffee Break

Session 2.4 (1600 – 1800 hrs): Starspots
Chair: Rachel Osten

1600 hrs	Klaus G. Strassmeier	*The zoo of starspots**
1625 hrs	Julien Morin	*Exploring the magnetic topologies of cool stars**
1650 hrs	Andrea Dupree	*Spots on Betelgeuse: What are they?**
1715 hrs	David Montes	*High resolution spectroscopy of late-type stars: understanding the chromospheric activity paradigm, the local properties of the Galaxy and comparative planetology*
1730 hrs	Maurizio Ternullo	*The Butterfly Diagram Leopard Skin Pattern*
1745 hrs	Matteo Cantiello	*Turbulence and magnetic spots at the surface of hot massive stars*

3. Wednesday, 25 August 2010: The Atmospheric Connection

0730 hrs: Breakfast

Session 3.1 (0800 – 1000 hrs): Sunspots
Chair: R. Komm

0800 hrs	Klaus Galsgaard	*Coronal heating at null points and separators**
0825 hrs	Carsten Denker	*Velocity Fields in and around Sunspots at the Highest Resolution**
0850 hrs	Thomas Wiegelmann	*Modeling solar coronal magnetic fields**
0915 hrs	Sanjay Gosain	*Evolution of twist-shear and dip-shear in a flaring delta-sunspot: Hinode observations*
0930 hrs	Na Deng	*What Determines the Penumbral Size and Evershed Flow Speed?*
0945 hrs	Laure Lefevre	*In-depth survey of sunspot and active region catalogs*

1000 – 1020 hrs: Coffee Break

Session 3.2 (1020 – 1220 hrs): Sunspots
Chair: Carsten Denker

1020 hrs	Sami K. Solanki	*The Sun at high resolution: first results from the Sunrise mission**
1045 hrs	Saku Tsuneta	*Review of discoveries from Hinode**
1110 hrs	Guillaume Aulanier	*Coronal flaring and heating in quasi-separatrix layers**
1135 hrs	Etienne Pariat	*3D numerical modeling of the trigger of jets above magnetic sunspots*
1150 hrs	Eugene Avrett	*A New Sunspot Chromospheric Model Based on the SUMER EUV Spectrum*
1205 hrs	Antonio Pasqua	*Derivation of 3D magnetic topology of solar active regions from 2D magnetograms using stereoscopy of rotation*

1220 – 1340: Lunch

Session 3.3 (1340 – 1555 hrs): Starspots
Chair: Tom Ayres

1340 hrs	Moira Jardine	*Modeling stellar coronal magnetic fields**
1405 hrs	Oleg Kochukhov	*The spots on Ap stars**

1430 hrs	Thorsten A. Carroll	*Inversion Techniques for Stellar Magnetic Fields and Starspots -- On the Incoherence of DI and ZDI**
1455hrs	Alex Golovin	*FR Cnc: Revisited. Photometry, Polarimetry and Spectroscopy*
1510 hrs	Igor Savanov	*Stellar active longitudes and flip-flops from the space and ground-based observations*
1525 hrs	Jörn Warnecke	*Surface appearance of dynamo-generated large-scale fields*
1540 hrs	Adam Kowalski	*The Optical/NUV Continuum Properties of M Dwarf Flares*

1600 – 1800: Poster Session

1830: Banquet

4. Thursday, 26 August 2010: "Global" Stellar Activity?

0730 hrs: Breakfast

Session 4.1 (0800 – 1000 hrs): Starspots
Chair: S. Jeffers

0800 hrs	Svetlana Berdyugina	*The magnetic field in starspots**
0825 hrs	Wes Lockwood	*Stellar Activity and Brightness Variations: Results from Bright Solar Analogs and Future Directions**
0850 hrs	Jeongwoo Lee	*Sunspots at Centimeter Wavelengths**
0915 hrs	Nicholas Nelson	*Global Magnetic Cycles in Rapidly Rotating Younger Suns*
0930 hrs	S.P. Rajaguru	*Magneto-hydrostatic equilibrium in starspots: dependences on color (T_eff) and surface gravity (g)*
0945 hrs	Isabelle Boisse	*Disentangling stellar activity and planetary signals*

1000 – 1020: Coffee Break

Session 4.2 (1020 – 1220 hrs): Starspots and Sunspots
Chair: S. Saar

1020 hrs	Rainer Arlt	*Global MHD phenomena and their importance for stellar surfaces**
1045 hrs	Thomas Ayres	*The Ups and Downs of Alpha Centauri**
1110 hrs	Duncan Mackay	*The Structure and Evolution of the Global Solar Magnetic Field**

1135 hrs	Theresa Lueftinger	*Surface structure of selected Ap stars - Magnetic Doppler Imaging and a Bayesian approach to star spot modeling*

1220 – 1340: Lunch

Session 4.3 (1340 – 1555 hrs): Sunspots & Symposium Summary
Chair: D. Choudhary

1340 hrs	Jose Carlos del Toro Iniesta	*Discovery of Solar Magnetism**
1415 hrs	Jim Klimchuk	*Symposium Summary: Sunspots**
1450 hrs	Thomas Ayres	*Symposium Summary: Starspots**

End of IAU Symposium 273

Speaker Program
with abstracts

(* = Invited Talk)

1. Monday, 23 August 2010: Origin of Magnetic Field

Session 1.1 (0800 – 1000 hrs): Sunspots
Chair: Hasan Singh

1.1.1 (0800 hrs) Cosmic Magnetic Fields in the Sun – Outstanding Problems of Modern Times (Invited Review)*

Eric Priest
St Andrews University, St Andrews, United Kingdom

In the Sun there has been recent progress towards answering several fundamental problems which have profound implications for the behaviour of cosmic magnetic fields in other stars. A review is given here of such problems, including identifying some of the outstanding questions that remain.

In the solar interior, the main dynamo operates at the base of the convection zone, but its details have not been identified. In the solar surface, recent observations have revealed may new and surprising properties of magnetic fields, but the understanding of the key processes of flux emergence, fragmentation, merging and cancellation is rudimentary. Sunspots themselves remain an enigma.

In the atmosphere, there are many new ideas for coronal heating and solar wind acceleration, but eh mechanisms have not yet been pinned down. Also, the detailed mechanisms for solar flares and coronal mass ejections remain controversial.

In future, new generations of space and ground-based measurements and computational modelling should enable a definitive physical understanding of these puzzles.

1.1.2 (0825 hrs) **3D numerical MHD modeling of sunspots with radiation transport***

Matthias Rempel
National Center for Atmospheric Research, Boulder, CO, United States

Sunspot fine structure has been modeled in the past by a combination of idealized magneto-convection simulations and simplified models that prescribe the magnetic field and flow structure to a large degree. Advancement in numerical methods and computing power has enabled recently 3D radiative MHD simulations of entire sunspots with sufficient resolution to address details of umbral dots and penumbral filaments. After a brief review of recent developments I will focus on the magneto-convective processes responsible for the complicated magnetic structure of the penumbra and the mechanisms leading to the driving of strong horizontal outflows in the penumbra (Evershed effect) as well as large scale outflows in the periphery of sunspots (moat flows). Strong horizontal outflows in the sunspot penumbra can be explained through a redistribution of kinetic energy preferring flows along the filaments. This redistribution is facilitated primarily through the Lorentz force, horizontal pressure gradients play only a minor role. On the other hand, large scale flow patterns outside sunspots are primarily pressure driven and result from a preferred alignment of convection cells imposed by the presence of the sunspot.

The National Center for Atmospheric Research is sponsored by the National Science Foundation.

1.1.3 (0850 hrs) **The Structure of the Sunspots***

Kiyoshi Ichimoto
Kyoto University, Takayama, Gifu, Japan

The sunspot is the most distinguished manifestation of the magnetic fields on the sun serving as a fundamental measure of the 'Solar activity'. It is known from the recent ground-based observations that sunspots are extremely rich in fine scale structures and dynamics whose origin is yet unknown. The Solar Optical Telescope (SOT) aboard Hinode provides a new view of the sunspots with its unprecdented constant image quality and precise spectropolarimetry with a high spatial resolution. The SOT discovered penumbral micro jets, twisting motions of penumbral filaments, jets from light bridge associated with a strong electric current, supersonic down flow in and around the penumebra, and so on. SOT also demonstrated the individual source and sink of the Evershed flow, and shed a light on the long-standing mystery on the origin of the the penumbral fine structure and their dynamics. There are a number of studies also on the umbral dots, umbral oscillations, moving magnetic features and magnetic structure of pores. Recent achievements in study of sunspot structure, ie., their intensity, velocity, and magnetic field structures, from SOT/Hinode observations will be reviewed.

1.1.4 (0915 hrs) **Observational Evidence of Back-reaction on the Solar Surface Associated with Coronal Magnetic Restructuring in Solar Eruptions**

Haimin Wang, Chang Liu
NJIT, Newark, NJ, United States

Most models of solar eruptions assume that coronal field lines are anchored in the dense photosphere and thus the photospheric magnetic fields would not have rapid, irreversible changes associated with eruptions resulted from the coronal magnetic reconnection. Motivated by the recent work of Hudson, Fisher & Welsch (2008) on quantitatively evaluating the back reaction due to energy release from the coronal fields, in this Letter we synthesize our previous studies and present analysis of new events about flare-related changes of photospheric magnetic fields. For the 11 X-class flares where vector magnetograms are available, we always find an increase of transverse field at the polarity inversion line (PIL) although only 4 events had measurements with 1 minute temporal

resolution. We also discuss 18 events with 1 minute cadence line-of-sight magnetogram observation, which all show prominent changes of magnetic flux contained in the flaring spot region. Except in one case, the observed limb-ward flux increases while disk-ward flux decreases rapidly and irreversibly after flares. These observational evidence provide strong support, either directly or indirectly, for the theory and prediction of Hudson, Fisher & Welsch that the photospheric magnetic fields must respond to coronal field restructuring and turn to a more horizontal state near the PIL after eruptions.

1.1.5 (0930 hrs) **Helicity of the Solar Magnetic Field**

Sanjiv Kumar Tiwari
Udaipur Solar Observatory, Physical Research Laboratory, Dewali, Bari Road, Udaipur, Rajasthan, India

Magnetic helicity measures the complexity in the field. It is given by a volume integral over the scalar product of magnetic field **B** and its vector potential **A**. Direct computation of magnetic helicity in the solar atmosphere is not possible due to unavailability of the observations at different heights and also due to non-uniqueness of **A**. We clarified the physical meaning of the force-free parameter and its relation with the magnetic helicity. We have studied the effect of polarimetric noise on estimation of various magnetic parameters. We examined the fine structures of local current and in the sunspots. We have introduced the concept of signed shear angle (SSA) for sunspots and established its importance for non force-free fields. We find that there is no net current in the sunspots even in presence of a significant twist which is consistent with the fibril-bundle structure of sunspots. We studied the spatially averaged SSA (SASSA) of sunspots and peak X-ray flux to predict the flare activity. A good correlation is found between the sign of helicity in the sunspots at the photosphere and the chirality of the associated chromospheric and coronal features. We find that a large number of sunspots observed in the declining phase of solar cycle 23 do not follow the hemispheric helicity rule whereas most of the sunspots observed in the beginning of solar cycle 24 do follow. This indicates a long term behaviour of the helicity patterns in the Sun. The above sums up my PhD thesis.

1.1.6 (0945 hrs) **Solar imaging spectropolarimetry with the combination of two Fabry-Pérot etalons and a grating spectrograph**

***Lucia Kleint*[1]*, Alex Feller*[3]
[1]*Institute of Astronomy, ETH Zurich, 8093 Zurich, Switzerland,* [2]*Istituto Ricerche Solari Locarno (IRSOL), 6605 Locarno Monti, Switzerland,* [3]*Max-Planck-Institut fuer Sonnensystemforschung, 37191 Katlenburg-Lindau, Germany*

Spectropolarimetric imaging provides a valuable tool for studying the magnetic field of sunspots. By recording the polarization of several spectral lines with suitable Landé factors and different formation heights, a height dependency of the magnetic field can be derived.
Several instrument combinations are suited for this task, each with different advantages and drawbacks. We will present a novel instrument combination consisting of two $LiNbO_3$ Fabry-Pérot (FP) etalons, a high-resolution grating spectrograph, and the ZIMPOL system for polarimetry, whose main advantage is the ability to obtain monochromatic images in any spectral line between 390-660 nm. In contrast to other FP systems, we do not require a special prefilter for each desired spectral region, but instead use the spectrograph as a prefilter. A slight disadvantage of the instrument is the spatial smearing induced by the dispersion of the finite transmission profiles of the FP etalons, which however is of the same magnitude as the seeing-limited resolution of 1 arcsec at IRSOL. A good polarimetric sensitivity and a very high spectral resolution will enable us to obtain 3D images of sunspots and their physical properties with unprecedented spectral coverage.

Session 1.2 (1020 – 1220 hrs): Sunspots
Chair: Karel Schrijver

1.2.1 (1020 hrs) **Origin of Solar Magnetism***

Arnab Choudhuri
Department of Physics, Indian Institute of Science, Bangalore - 560012, India

The solar magnetic cycle is believed to be produced by a flux transport dynamo, in which the toroidal field is produced from the poloidal field by stretching due to differential rotation, the poloidal field is produced by the Babcock-Leighton process and the meridional circulation plays an important role. I shall survey the important developments in the flux transport dynamo model and then discuss how this model can be applied to explain the irregularities of the sunspot cycle, leading to the possibility of predicting the strengths of future cycles.

1.2.2 (1045 hrs) **Diagnostics for spectropolarimetry and magnetography***

***Jose Carlos del Toro Iniesta*[1]*, Valentín Martínez Pillet*[2]
[1]*IAA (CSIC), Granada, Spain,* [2]*IAC, La Laguna, Spain*

An assessment on the capabilities of modern spectropolarimeters and magnetographs is in order since most of our astrophysical results rely upon the accuracy of the instrumentation and on the sensitivity of the observables to variations of the sought physical parameters. A contribution to such an assessment will be presented in this talk where emphasis will be made on the use of the so-called response functions to gauge the probing capabilities of spectral lines and on an analytical approach to estimate the uncertainties in the results in terms of instrumental effects. The Imaging Magnetograph eXperiment (IMaX) will be used as a study case.

1.2.3 (1110 hrs) **Heating of coronal active regions***

Daniel Gomez[1]
[1]*Instituto de Astronomia y Fisica del Espacio, Buenos Aires, Argentina,* [2]*Departamento de Fisica, Facultad de Ciencias Exactas y Naturales, UBA, Buenos Aires, Argentina*

Recent observations of coronal loops in solar active regions show that their heating must be a truly dynamic process. Even though it seems clear that the source of this heating is the magnetic field that confines the coronal plasma, the details of how it dissipates are still a matter of debate. In this presentation we review the theoretical models of coronal heating, which have been traditionally clasified as DC or AC depending on the electrodynamic response of the loops to the photospheric driving motions.

Also, we show results from numerical simulations of the internal dynamics of coronal loops within the framework of the reduced MHD approximation. These simulations indicate that the application of a stationary velocity field at the photospheric boundary leads to a turbulent stationary regime after several photospheric turnover times. Once this stationary turbulent regime is set, both DC and AC stresses dissipate at faster rates as a result of a direct energy cascade. The intermittent nature of turbulence is responsible for the highly dynamic behavior of the heating process. The energy dissipation events are shown to be impulsive, which we associate to the so-called nanoflares. Moreover, a statistical analysis of these events yields a power law distribution as a function of their energies, which is consistent with those obtained for flare energy distributions reported from X-ray observations.

1.2.4 (1135 hrs) **The evolution of magnetic fields in sunspots during solar cycle 23**

Fraser Watson, Lyndsay Fletcher
University of Glasgow, Glasgow, United Kingdom

The automated detection of solar features is a technique which is relatively underused but if we are to keep up with the flow of data from spacecraft such as the recently launched Solar Dynamics Observatory, then such techniques will be very valuable to the solar community. Automated detection techniques allow us to examine a large set of data in a consistent way and in relatively short periods of time allowing for improved statistics to be carried out on any results obtained. This is particularly useful in the field of sunspot study as catalogues can be built with sunspots detected and tracked without any human intervention and this provides us with a detailed account of how various sunspot properties evolve over time. I will discuss the results from some work undertaken using data from the MDI instrument on SOHO. Utilising magnetic and continuum intensity observations, I will look at the fragmentation of magnetic solar active regions as well as the time evolution of magnetic field strengths in sunspots over the 15 years that SOHO has been observing.

1.2.5 (1150 hrs) **Vector magnetic fields of superactive sunspot groups**

Jingxiu Wang[1]***, Anqin Chen***[1]***, Joan Feynman***[2]***, Olga Panasenco***[2]
[1]*Key Laboratory of Solar Activity, National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China,* [2]*Helio Research, 5212 Maryland Avenue, La Crescenta, United States*

Each solar activity cycle is characterized by about a dozen superactive sunspot groups (or superactive regions) which produced the most violent events with the greatest influence on our human living environment of all solar activity. To quantify the superactive regions with vector magnetic field observations is of fundamental importance both for understanding the nature of violent solar activity, and for facilitating the forecast of disastrous space weather affecting Earth and space missions. We categorize superactive regions in the following parameters: 1) area of the sunpot groups, 2) X-ray flaring index, 3) F10.7 radio flux, 4) high energy proton flux, and 5) changes in total solar irradiance. We first selected a sample of superactive regions in the last three solar cycles. Afterwards we quantified the characteristics of superactive regions in the last two solar cycles with vector magnetic field observations from Huairou Solar Observing Station. Among the magnetic field characteristics that we analyze are: total magnetic flux evolution, magnetic non-potentiality, chirality and helicity patterns of evolution, and peculiarity of their magnetic field topology peculiarity. In this presentation, we report our initial results.

1.2.6 (1205 hrs) **On the Manifestation in the Sun-as-a-Star Magnetic Field Measurements of the Quiet and Active Regions**

Mikhail Demidov
Institute of Solar-Terrestrial Physics, Irkutsk, Russian Federation

The best way for testing of the stellar magnetic fields mapping codes is applying them, with some changes, to the Sun, where high-precision observations of the disk-integrated and disk-resolved observations are available for a long time. Data sets of full-disk magnetograms and solar mean magnetic fields (SMMF) measurements are available, for an example, at the Wilcox Solar Observatory (WSO) and on STOP telescope at the Sayan Solar Observatory (SSO). In the second case measurements in Stokes-meter mode simultaneously in many spectral lines are made. This study is devoted to analysis of the SSO quasi-simultaneous full-disk magnetograms and SMMF measurements . Changes of the SMMF signal with rotation of surface large-scale magnetic fileds are demonstrated. Besides, by means of artificial deleting from the maps of selected pixels with active or quiet regions their contribution to the integrated Stokes V-profiles is evaluated. It is shown that is same cases the role of active region pixels can be significant enough.

Session 1.3 (1340 – 1555 hrs): Starspots
Chair: Klaus Strassemier

1.3.1 (1340 hrs) **Oh! The Places You'll Go: Multi-wavelength Tracers of Stellar Magnetic Activity***

Rachel Osten
STScI, Baltimore, MD, United States

The observable manifestations of magnetic fields on cool stars range across the electromagnetic spectrum. At the shortest wavelengths, X-rays arise from magnetically heated coronal plasma, and study of transient heating events provides constraints on coronal length scales and magnetic field strengths required to confine the coronal plasma. X-ray line diagnostics provide newly used constraints on spatial scales, with a bias towards compact coronal loops. At the opposite end of the electromagnetic spectrum, radio observations diagnose the presence and action of accelerated particles in stellar atmospheres. The persistent nature of nonthermal stellar radio emission, in addition to transient events, points to both the global and localized nature of magnetic fields in stellar atmospheres. I will describe recent results which constrain characteristics of stellar magnetic regions using X-ray and radio emission from stars. In addition I will discuss the interrelationship of X-ray and radio emissions in light of what we can learn about magnetic structures on active stars.

1.3.2 (1405 hrs) **Starspots, Cycles and Magnetic Fields***

Steven Saar
SAO, Cambridge, MA, United States

I make a perhaps slightly foolhardy attempt to synthesize a semi-coherent scenario relating cycle characteristics, starspots, and the underlying magnetic fields with stellar properties such as mass and rotation. Key to this attempt is to first study single dwarfs; differential rotation plays a surprising role.

1.3.3 (1430 hrs) **The Evolution of Stellar Surface Activity and Possible Effects Involving Exoplanets***

Mark Giampapa
National Solar Observatory, Tucson, AZ, United States

The evolution of stellar activity involves a complex interplay between the interior dynamo mechanism, the emergent magnetic field configurations and their coupling with stellar winds, the subsequent angular momentum evolution, and fundamental stellar parameters. We will discuss the evolution of activity from the pre-main sequence through the main sequence phase. The pre-main sequence phase may include magnetic field interactions with a surrounding protoplanetary disk while activity evolution on the early main sequence may include considerations involving core-envelope decoupling and recoupling. In the process we will discuss the development of new diagnostics of stellar surface activity. Possible connections with the evolution of young planetary atmospheres also will be reviewed. In particular, stellar activity may influence the evolution of young planetary atmospheres and define the high-energy portion of the ambient radiation and particle fields in which planetary atmosphere evolution occurs.

1.3.4 (1455 hrs) **Rotational Modulation, Shear, and Cyclic Activity in HII 1883**

Jacquelynne Milingo[1], Steve Saar[2], Laurence Marschall[1], John Stauffer[3]
[1]Gettysburg College, Gettysburg, PA, United States, [2]SAO, Cambridge, MA, United States, [3]Spitzer Science Center, Pasadena, CA, United States

We present a 30 year compilation of V-band differential photometry for the Pleiades K dwarf HII 1883. HII 1883 has an average rotational period < P_rot> of about 0.235 d and displays rotational modulation due to non-uniform surface brightness of as large as 0.2 magnitudes in V. Preliminary work yields a cycle period of about 8 years and rotational shear Delta P_rot/< P_rot> considerably less than solar. With such a long baseline of data available we can explore many aspects of the star's photometric variability. We present studies of the variation of the rotational modulation amplitude, < V>, and P_rot over the cycle.

1.3.5 (1510 hrs) **Starspot Variability and Evolution from Modeling KEPLER Photometry of Active Late-type Stars**

Alexander Brown[1], Heidi Korhonen[2], Svetlana Berdyugina[1], Barton Tofany[1], Thomas Ayres[1], Adam Kowalski[4], Suzanne Hawley[4], Graham Harper[5], Nikolai Piskunov[6]
[1]University of Colorado, Boulder, CO, United States, [2]ESO, Garching, Germany, [3]KIS, Freiburg, Germany, [4]University of Washington, Seattle, United States, [5]Trinity College, Dublin, Ireland, [6]Uppsala University, Uppsala, Sweden

The KEPLER satellite provides a unique opportunity to study the detailed optical photometric variability of late-type stars with data that provide unprecedentedly long (several year) continuous monitoring and sensitivity to very smallscale variations. We describe the sample of over two hundred cool (spectral types late A - late K) stars that we are studying using Kepler long-cadence (30 minute sampling) observations. We show the remarkable range of observed forms of photometric variability detected, concentrating on starspot rotational modulation and flaring. Modulation at the 0.1% level is readily discernable. We illustrate the rapid timescales of starspot evolution using a variety of spot modeling inversion techniques for solar-like stars with rotational periods between 2 and 7 days based on our first nine months of KEPLER data.

This work is supported by NASA Kepler Cycle 1 grant NNX10AC51G.

1.3.6 (1525 hrs) **The impact of starspots on low-mass planet detection around M dwarfs**

***Sandra Jeffers*[1], *John Barnes*[2], *Hugh Jones*[2]**
[1]SIU, University of Utrecht, Utrecht, Netherlands, [2]University of Hertforshire, Hertforshire, United Kingdom

With the growing interest in searching for earth-mass planets, we investigate the contribution of starspots to stellar jitter for M dwarf stars for both radial velocity and photometric transit detection methods. We extrapolate a model, used to describe Solar spot distributions, to simulate the spot patterns that we expect to find on M dwarfs from Doppler Images. Under the assumption that M dwarfs are fully convective, we randomly place spots at any latitude and longitude on a model star for different activity levels. Line profiles, and photometric lightcurves are derived from the randomly spotted stars for different rotational phases and are used to investigate starspot jitter. Using the spot models and a star with rotation velocity $v\sin i = 10 \mathrm{kms}^{-1}$, detection limits for earth-mass planets in habitable zones are simulated for observations between 10 and 500 epochs. We find that around 20 epochs are required to detect 1 earth mass planet orbiting 0.1 and 0.2 M_{sun} stars. We show the effect of $T_{photosphere}/T_{spot}$, vsini, and spot size on our detection thresholds.

1.3.7 (1540 hrs) **Effect of stratified turbulence on magnetic flux concentrations**

***Axel Brandenburg*[1], *Koen Kemel*[1], *Nathan Kleeorin*[3], *Igor Rogachevskii*[3]**
[1]Nordita, Stockholm, Sweden, [2]Stockholm University, Stockholm, Sweden, [3]Ben-Gurion University, Beer-Sheva, Israel

While the rising flux tube paradigm is an elegant theory, its basic assumptions, thin flux tubes at the bottom of the convection zone with field strengths of 2 orders of magnitude above equipartition, remain numerically unverified at best. As such, in recent years the idea of generating sunspots near the top of the convection zone has generated some interest. The presence of turbulence can strongly enhance diffusive transport mechanisms, leading to an effective transport coefficient formalism in the mean field formulation. The question is what happens to these coefficients when the turbulence is anisotropically suppressed, for example by the Lorentz force. It has been noted in the past that this anisotropy can also lead to very non diffusive-like behaviour. In the present work we investigate the generation of large scale magnetic structures as a result of the dependence of turbulent transport coefficients on the local magnetic field. In direct numerical simulations of forced turbulence in a stratified box, we verify the existence and field dependence of negative turbulent pressure effects.

2. Tuesday, 24 August 2010: Nature of Surface and Subsurface Magnetic Field

Session 2.1 (0800 – 1000 hrs): Starspots
Chair: Mark Giampapa

2.1.1 (0800 hrs) **Stellar activity, differential rotation and exoplanets***

Antonino Francesco Lanza
INAF-Osservatorio Astrofisico di Catania, Catania, Italy

I shall review the main results obtained from the spot modelling of the wide-band optical light curves of some of the stars hosting transiting planets discovered by the CoRoT space experiment. I shall describe the fitting of the out-of-transit light modulation of those stars by means of a model already tested with the total solar irradiance variations. This approach allows us to study the longitude distribution of the spotted area and its variations versus time during the five months of a typical CoRoT time series. The migration of the spots in longitude can be used to estimate a lower limit for the surface differential rotation and the variation of their total area can be used to look for short-term spot cycles akin the solar Rieger cycles. I shall also briefly discuss the possible impact of a close-in giant planet on stellar activity in the framework of recently proposed models for star-planet magnetic interaction and considering also the information coming from chromospheric and coronal observations.

2.1.2 (0825 hrs) Study of stellar activity through transit mapping of starspots*

Adriana Valio
Mackenzie University, Sao Paulo/SP, Brazil

During the eclipse of a planet, spots and other features on the surface of the host star may be occulted. This will cause small variations in the light curve of the star. Detailed studies of these variations during planetary transits provide a wealth of information about the starspots properties such as size, position, temperature (i.e. intensity), and magnetic field. If observation of multiple transits is available, the spots lifetime can be estimated. Moreover it may also be possible determine the stellar rotation and whether differential rotation is present. The study is performed using a method that simulates the passage of a planet (dark disk) in front of a star with multiple spots of different sizes, intensities, and positions. The data variations in the light curve of the star are fit using this method, yielding the starspots properties. Results are presented for solar-like stars, such as the active star CoRoT-2a and a more quiet one, HD 209458.

2.1.3 (0850 hrs) **Time-series photometry and starspot properties***

Katalin Olah
Konkoly Observatory, Budapest, Hungary

Systematic efforts of monitoring starspots from the middle of the XXth century, and the results obtained from the datasets, are summarized with special focus on the observations made by automated telescopes. Multicolour photometry shows correlations between colour indices and brightness, indicating spotted regions with different average temperatures

originating from spots and faculae. Long-term monitoring of spotted stars reveals variability on different timescales. On the rotational timescale new spot appearances and starspot proper motions are followed from continuous changes of light curves during subsequent rotations. Long datasets, with only short, annual interruptions, shed light on the nature of stellar activity cycles and multiple cycles. The systematic and/or random changes of the spot cycle lenghts are discovered and described using various time-frequency analysis tools. Positions and sizes of spotted regions on stellar surfaces are calculated from photometric data by various softwares. From spot positions derived for decades, active longitudes on the stellar surfaces are found, which, in case of synchronized eclipsing binaries can be well positioned in the orbital frame, with respect to, and affected by, the companion stars. Sudden interchange of the more and less active hemispheres on the stellar surfaces is the so called flip-flop phenomenon. Finally, the existence and strength of the differential rotation is seen from the rotational signals of spots being at different stellar latitudes.

2.1.4 (0915 hrs) **Exploring the Deep Convection and Magnetism of A-type stars**

***Nicholas Featherstone*[1], *Matthew Browning*[2], *Allan Sacha Brun*[3], *Juri Toomre*[1]**

[1]JILA, University of Colorado, Boulder, CO, United States, [2]CITA, University of Toronto, Toronto, Canada, [3]SAp, CEA Saclay, Saclay, France

A-type stars have both a near-surface layer of fast convection that can excite acoustic modes and a deep zone of core convection whose properties may be probed with asteroseismology. Many A-type stars also exhibit large magnetic spots that are often attributed to surviving primordial fields of global scale in the intervening radiative zone. We have explored the potential for core convection in rotating A-type stars to build strong magnetic fields through dynamo action. These 3-D simulations using the ASH code provide guidance on the nature of differential rotation and magnetic fields that may be present in the deep interiors of these stars, thus informing the asteroseismic deductions now becoming feasible. Our models encompass the inner 30% by radius of a two solar mass A-type star, rotating at four times the solar rate and capturing the convective core and a portion of the overlying radiative envelope. Convection in these stars drives a strong retrograde differential rotation and yields a core that is prolate in shape. When dynamo action is admitted, the convection generates strong magnetic fields largely in equipartition with the dynamics. Remarkably, introducing a modest but large-scale external field threading the radiative envelope (which may be of primordial origin) can substantially alter the turbulent dynamics of the convective interior. The resulting convection involves a complex assembly of helical rolls that link distant portions of the core and stretch and advect magnetic field, ultimately yielding magnetic fields of super-equipartition strength.

2.1.5 (0930 hrs) **Chemical spots and their dynamical evolution on the surface of late B-type stars with HgMn peculiarity**

***Heidi Korhonen*[1], *Swetlana Hubrig*[2], *Maryline Briquet*[3], *Federico Gonzalez*[4], *Igor Savanov*[5], *Thomas Hackman*[6]**

[1]European Southern Observatory, Garching bei Muenchen, Germany, [2]Astrophysical Institute Potsdam, Potsdam, Germany, [3]Instituut voor Sterrenkunde, Leuven, Belgium, [4]Instituto de Ciencias Astronomicas, San Juan, Argentina, [5]Institute of Astronomy, Moscow, Russian Federation, [6]Division of Geophysics and Astronomy, Helsinki, Finland

Our recent study of the late B-type star HD 11753 with HgMn peculiarity revealed a fast dynamical evolution of chemical surface spots. This result implies a hitherto unknown process operating in late B-type stars with radiative envelopes. We have obtained additional observations using the CORALIE spectrograph at the Swiss 1.2m telescope on La Silla, Chile, to study the distribution of chemical spots in a sample of HgMn stars. Here we will discuss the dynamical spot evolution on the surface of late B-type stars and its implication for our understanding of their atmospheres.

2.1.6 (0945 hrs) **Differential rotation on the young solar analogue V889 Herculis**

***Zsolt Kovari*[1], *Antonio Frasca*[2], *Katia Biazzo*[3], *Krisztian Vida*[1], *Ettore Marilli*[2], *Omur Cakirli*[4]**

[1]Konkoly Observatory, Budapest, Hungary, [2]INAF - Catania Astrophysical Observatory, Catania, Italy, [3]INAF - Arcetri Astrophysical Observatory, Firenze, Italy, [4]Ege University, Astronomy and Space Sciences Dept., Bornova, Izmir, Turkey

V889 Herculis (HD 171488) is one of the brightest single early-G type star, a young Sun, that is rotating fast enough (P_{rot} = 1.337 days) for mapping its photosphere by Doppler Imaging. The 11 FOCES spectra collected between 13-16 Aug 2006 at Caral Alto Observatory allowed us to reconstruct one single Doppler map, which revealed an asymmetric polar cap and several weaker features at lower latitudes. In recent Zeeman-Doppler imaging studies (Marsden et al. 2006, Jeffers & Donati 2009) strong solar-type surface shear (Ω/Ω 0.1) was reported. However, implications from earlier photometric study by Strassmeier et al. (2003) and more recently by Jarvinen et al. (2008) suggest weaker surface shear by a factor of 3, or more. We perform a new investigation of detecting surface shear from Doppler imaging to give proof in favor of or against previous findings.

Session 2.2 (1020 – 1220 hrs): Sunspots
Chair: Cristina Cadavid

2.2.1 (1020 hrs) **Long-term Evolution of Sunspot Magnetic Fields***

Matthew Penn*, *William Livingston

National Solar Observatory, Tucson, AZ, United States

Independent of the normal solar-cycle, a linear decrease in the sunspot magnetic field strength has been observed in synoptic infrared

observations taken by Livingston at the NSO Kitt Peak McMath-Pierce telescope. This trend was seen to continue in observations of the first sunspots of the new solar cycle 24, and extrapolating this pattern would lead to only half the number of spots in Cycle 24 compared to Cycle 23, and to virtually no sunspots in Cycle 25.

We examined synoptic observations from the NSO Kitt Peak Vacuum Telescope and found a change in sunspot intensity and magnetic flux which roughly agreed with the infrared observations. A more detailed examination of both data sets reveals that the relationship of the sunspot magnetic fields with intensities, or with sunspot size, remain constant during the period of observation. While the observations show a lot of scatter, at a barely significant level we see that smaller, brighter and magnetically weaker spots have appeared more frequently as time passes.

2.2.2 (1045 hrs) **The formation of a sunspot penumbra***

Rolf Schlichenmaier, Nazaret Bello Gonzalez, Reza Rezaei
Kiepenheuer-Institut fuer Sonnenphysik, Freiburg, Germany

The generation of magnetic flux in the solar interior and its transport to the outer solar atmosphere will be in the focus of solar physics research for the next decades. One key-ingredient is the process of flux emergence into the solar photosphere, and how the magnetic flux reorganizes to form the magnetic phenomena of active regions like sunspots and pores.

On July 4, 2009, we observed a region of emerging magnetic flux, in which a proto-spot without penumbra forms a penumbra within some 5 hours. This process is documented by multi-wavelength observations at the German VTT: (a) imaging, (b) data with high resolution and temporal cadence acquired in Fe I 617.3 nm with the 2D imaging spectropolarimeter GFPI, and (c) scans with the slit based spectropolarimeter TIP in Fe I 1089.6 nm.

During the formation of the penumbra, the area and the magnetic flux of the spot increases. The additional magnetic flux is supplied by the adjacent region of emerging magnetic flux: As emerging bipole separate, the poles of the spot polarity migrate towards the spot, and finally merge with it. As more and more flux is accumulated a penumbra forms. From fitting the Stokes profiles to an atmosphere with constant magnetic field and velocity along the line-of-sight, we infer maps of velocity, magnetic field inclination, and field strength for our time series. This enables us to witness the onset of the Evershed flow and the associated enhanced field inclination as individual penumbral filaments form.

2.2.3 (1110 hrs) **Subsurface structure of sunspots***

Laurent Gizon
Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany

The structure, dynamics, and evolution of sunspots below the solar surface are poorly known. The ability to distinguish between competing sunspot models relies on spectropolarimetric and helioseismic observations. I will review observations of the effects of sunspots on the propagation of f and p modes: wave travel times, amplitudes, finite-wavelength effects. The only sensible way of trying to interpret these observations is using numerical simulations of wave propagation through various model sunspots. I will present such simulations using a parametric, semi-empirical sunspot model that captures the near-surface magnetic and thermodynamics properties of the observed sunspot in NOAA 9787. The model can be tuned to have a seismic signature (f, p1, p2) that is consistent with the observations, given the level of noise. How to extract information about the deep structure of sunspots is still an open question. The moat outflow outside the sunspot is measured in the top four megameters.

2.2.4 (1135 hrs) **Solar subsurface flows of active regions: flux emergence and flare activity**

Rudolf Komm, Rachel Howe, Frank Hill, Kiran Jain
National Solar Observatory, Tucson, AZ, United States

We study the temporal variation of subsurface flows associated with active regions within 16 Mm of the solar surface. We have analyzed the subsurface flows of nearly 1000 active and quiet regions applying ring-diagram analysis to Global Oscillation Network Group (GONG) data focusing on two topics: (1) the emergence of active regions and (2) the flare activity of active regions. In previous studies, we have found that the vertical velocity component is a good indicator of temporal changes in magnetic flux. Here, we are distinguishing between newly emerging active regions and flux emerging in already existing regions. In previous studies, we have shown that the flare activity of solar active regions is intrinsically linked with the vorticity of solar subsurface flows on spatial scales comparable to the size of active regions and on tempora scales from days to the lifetime of active regions. Here, we are focusing on improving the parameterization of the relation. We will present the latest results.

2.2.5 (1150 hrs) **Twist and writhe of island active regions**

Marcelo Lopez-Fuentes[1], Cristina Mandrini[1], Pascal Demoulin[2]
[1]Instituto de Astronomia y Fisica del Espacio (IAFE), Buenos Aires, Argentina, [2]Observatoire de Paris, Meudon, France

We study the magnetic helicity properties of a set of peculiar active regions (ARs) including islands and high-tilt bipolar configurations. These ARs are usually identified as the most active in terms of flare and CME production. Due to their observed structure, they have been associated with the emergence of magnetic flux tubes that develop a kink instability. Our main goal is to determine the chirality of the twist and writhe components of the AR magnetic helicity in order to set constrains on the possible mechanisms producing the flux tube deformations. We determine the magnetic twist comparing observations of the AR coronal structure with force-free models of the magnetic field. We infer the flux-tube writhe from the rotation of the main magnetic bipole during the observed evolution. From the relation between the obtained twist and writhe signs we conclude that the development of the kink instability cannot be the single mechanism that originates deformed flux-tubes.

2.2.6 (1205 hrs) **Pre-Eruption Configuration in the Active-Region Solar Photosphere**

Manolis K. Georgoulis
RCAAM, Academy of Athens, Athens, Attica, Greece

A brief overview of the basic photospheric magnetic configurations leading to intense solar eruptions (flares and coronal mass ejections) is given, with an emphasis on the formation of strong magnetic polarity inversion lines (PILs) and the underlying physics of the process. We advocate that the debate between the existence of an unstable pre-eruption magnetic flux rope and the action of an excessive shear along the PIL, thought to trigger the eruption if overlying topological conditions are suitable, may be of little meaning: the Lorentz force acting persistently and systematically along the PIL may be able to facilitate eruption conditions with or without a flux rope and under no requirement of excessive magnetic shear. We maintain that this can be achieved via an interplay between shear and magnetic helicity with shear being a physical consequence of the Lorentz force and helicity being a consequence of shear. Other qualitative properties of the pre-eruption configuration along the PIL can be explained naturally by means of this eruption scenario.

Session 2.3 (1340 – 1555 hrs): Sunspots
Chair: J. del Toro Iniesta

2.3.1 (1340 hrs) **Evershed and moat flows: one and the same thing?***

Valentin Martinez Pillet
Instituto de Astrofísica de Canarias, La Laguna, Spain

Two mass flows are known to exists in sunspot with developed penumbrae. The Evershed flow, observed within the penumbra and with a somewhat abrupt end near the edge of the sunspot and the moat flow, a supergranular-type flow that surrounds all mature spots. The area dominated by the moat flow is the region that displays the most dynamic bipolar activity observed in the solar surface known as moving magnetic features. I will review recent evidence suggesting that the moat flow is nothing but the continuation of the Eveshed flow beyond the sunspot boundary. The implications of this statement in the light of recent MHD simulations of complete sunspots systems and new pore observations will be discussed.

2.3.2 (1405 hrs) **Solar chromospheric magnetic field***

Hongqi Zhang
National Astronomical Observatories, Chinese Academy of Sciences, Beijing, China

It is important to understand the possible spatial configuration of the magnetic field of the Sun. In this talk, we would like to discuss some developments on the study of solar choromospheric magnetic fields, especially on the observational study. Some of them have been taken at Huairou Solar Observing Station of China.

2.3.3 (1430 hrs) Magnetic field evolution of active regions and sunspots in connection with chromospheric and coronal activities*

Toshifumi Shimizu
ISAS/JAXA, Sagamihara, Japan

Ca II H imaging observations by the Hinode Solar Optical Telescope (SOT) have revealed that the chromosphere is extremely dynamic, especially around sunspots. Chromospheric ejections and jets are well observed in moat region around sunspots. X-ray observations show frequent occurrence of microflaring activities around sunspots; small emerging flux or some type of moving magnetic features can be identified on the footpoints for half of microflares studied, but no clear magnetic activities are observed at footpoints even with SOT high spatial magnetorams (Kano et al. 2010). Some type of sunspot light bridges shows recurrent occurrence of chromospheric ejections, and photospheric vector magnetic field data suggests that helical magnetic flux tubes lying along light bridge play vital roles in producing such ejections (Shimizu et al. 2009). Katsukawa et al. (2007) newly found penumbral microjets in sunspot penumbra and suggested magnetic field configuration for producing microjets. By combining Ca II H imaging observations with SOT magnetogram and Stokes-Polarimetric observations, magnetic origins responsible for various kinds of dynamics and heatings in chromosphere and corona are under study. This talk will review observational findings from these studies.

2.3.4 (1455hrs) **Solar activity due to magnetic complexity of active regions**

Brigitte Schmieder[1], Cristina Mandrini[2], Ramesh Chandra[3], Pascal Démoulin[1], Tibor Török[1], Etienne Pariat[1], Wahab Uddin[3]
[1]Observatoire de Paris, Meudon, France,[2]IAFE, Buenos Aires, Argentina,[3]ARIES, Nainintal, India

The active regions involved in the Halloween 2003 extremely violent flares were still the source of unusual solar activity at the next solar rotation. The flares of 18-20 November occurring in the AR NOAA10501 were accompanied by coronal mass ejections which induced some particularly geoeffective magnetic clouds. Our topological analysis of the magnetic flux and helicity injection revealed that shearing motions continuously energized the region. The stored energy was eventually released through the interaction of the various systems of magnetic loops by several magnetic reconnection events. Even though two of the flares had an homologous character, they were apparently triggered by different mechanisms. We found evidence for tether-cutting in the first event and magnetic breakout in the second one. During the first flare, two filaments were merging and splitting, suggestive of 'sling-shot' reconnection between two coronal flux ropes. We successfully tested this scenario in a 3D MHD simulation that will be presented here too.

2.3.5 (1510 hrs) **Relationships between the Chirality of Sunspots, Filament Channels and Filaments**

***Sara F. Martin*[1], *Olga Panasenco*[1], *Brittany McCrigler*[1], *Jingxiu Wang*[1]**
[1]Helio Research, La Crescenta, CA 91214, United States, [2]Key Laboratory of Solar Activity, NAO, Chinese Academy of Sciences, Beijing 100012, China

The first discovered solar form of chirality was in the penumbral and superpenumbral fibrils around sunspots investigated by Richardson (1941). A confirmation of this chirality by Rust and Martin (1994) demonstrated that sunspot chirality fits into the 1 to 1 pattern of chiral relationships of filament channels and filaments; clockwise superpenumbral and penumbral fibrils are paired with neighboring sinistral filament channels and filaments while counterclockwise fibrils pair with dextral filament channels and filaments. In this paper, we define the magnitude of sunspot chirality by a measure of the angle of the superpenumbral fibrils with respect to radial fibrils defined as having 0 chirality. This measure is found to be related to the distance between the sunspot and the nearest filament channel. Additionally the degree of chirality around sunspots is often asymmetric. Greatest curvature strongly tends to be on the side of a spot that is closest to a filament channel. We further investigate the temporal development of the magnitude and sign of sunspot chirality. We suggest that the chirality of sunspot penumbral fibrils and the chirality of filament channels and filaments have a common cause. A satisfactory explanation for the development of the chirality of filament channels and filaments is magnetic reconnection near the photosphere which is manifested as cancelling magnetic fields (Litvinenko and Martin 1999; Litvinenko, Chae and Park 2007). We suggest that the horizontal magnetic fields built by this mechanism also results in most of the curvature of penumbral fibrils, the signature of the chirality of sunspots.

2.3.6 (1525 hrs) **Nature of the unusually long solar cycles**

Nadezhda Zolotova*, *Dmitri Ponyavin
Institute of Physics of St. Petersburg State University, St.Petersburg, Russian Federation

The evolution of prolonged and unusually long solar cycles such as 23rd, 20th, and especially 4th is considered. Why the length of the 4th cycle was exceptionally large or really composed of two short cycles? Are the prolonged solar minima can be considered as precursor of low activity of the next cycles? Resolving these puzzles seems to be very important for dynamo theories trying to explain the solar long-term variations. We propose a possible model of the butterfly diagram during unusually long and prolonged cycles, based on (i) the Gnevyshev idea of sunspot distribution over the latitudes, and (ii) the phase differences of the northern and southern hemispheric activities. Special attention is given to the butterfly reconstruction just before the Dalton Minimum.

Session 2.4 (1600 – 1800 hrs): Starspots
Chair: Rachel Osten

2.4.1 (1600 hrs) **The zoo of starspots***

Klaus G. Strassmeier
AIP, Potsdam, Germany

I will highlight recent results from Doppler and Zeeman Doppler imaging of cool stars, including the global and evolutionary astrophysical properties of the stars with spots. Many early results were based on light curve modelling of decade long photometric data sets that are still not rivalled by spectroscopy yet but a combination of various techniques - photometry, spectroscopy and interferometry - showed first promising results. I will further try to compare spots of stars at very different evolutionary stages, spanning from accreting pre-main sequence stars to giants at the tip of the RGB.

2.4.2 (1625 hrs) **Exploring the magnetic topologies of cool stars***

***Julien Morin*[1], *Jean-François Donati*[1]**
[1]Dublin Institute for Advanced Studies, Dublin, Ireland, [2]LATT, Université de Toulouse & CNRS, Toulouse, France

Magnetic fields of cool stars can be directly investigated through the study of the Zeeman effect on photospheric spectral lines, using several approaches. With spectroscopic measurement in unpolarised light, the total magnetic flux averaged over the stellar disc can be derived but very little information on the field geometry is available. Spectropolarimetry provides a complimentary information on the large- and medium-scale components of the vector magnetic field. With Zeeman-Doppler Imaging (ZDI), this information can be retrieved to produce a map a the vector magnetic field at the surface of the star, and in particular to assess the relative importance of the poloidal and toroidal components as well as the degree of axisymmetry of the field distribution.

The development of high-performance spectropolarimeters associated with multi-lines techniques and ZDI allows us to explore magnetic topologies throughout the H-R diagram, on stars spanning a wide range of mass, age and rotation period. These observations bring novel constraints on magnetic field generation by dynamo effects in cool stars. The study of solar twins brings new insight on the impact of stellar rotation on the solar dynamo, whereas the detection of strong and stable dipolar magnetic fields on fully-convective stars questions the role of the tachocline in this process. First observations of T Tauri stars suggest that dynamo processes similar to that of main-sequence fully convective stars already operates in these objects.

2.4.3 (1650 hrs) **Spots on Betelgeuse: What are they?***

Andrea Dupree
Center for Astrophysics, Cambridge, MA, United States

The bright M2Iab supergiant Alpha Orionis (Betelgeuse) is a popular target for direct imaging due to its large apparent size in the optical and

even more extended ultraviolet atmosphere. A sequence of ultraviolet images of Betelgeuse were taken with the Faint Object Camera on HST spanning 4 years. These provide about 10 resolution elements over the ultraviolet surface and reveal the changing pattern of emission across the stellar chromosphere. Simultaneous photometry and radial velocity measures complement the ultraviolet imaging. The ultraviolet flux generally tracks the optical variations, but there may be a phase delay signaling an outwardly propagating wave. Ultraviolet surface features are present in all images, but differ in appearance and orientation. Characteristics of the bright areas appear consistent with the inhomogeneous break-out of a chromospheric shock wave near the polar region of Betelgeuse. Comparison will be made to spatially resolved spectroscopy, interferometric observations, and hydrodynamic models of the star.

2.4.4 (1715 hrs) **High resolution spectroscopy of late-type stars: understanding the chromospheric activity paradigm, the local properties of the Galaxy and comparative planetology**

David Montes
UCM, Universidad Complutense de Madrid, Madrid, Spain

This contribution describes our past and ongoing long-term high resolution spectroscopic surveys of FGKM stars. Accurate estimates of fundamental stellar parameters (Teff, log g, metallicity, [Fe/H], and microturbulent velocity), differential abundance analysis (chemical tagging), rotational velocities as well as radial velocities, Lithium abundance and several chromospheric activity indicators allow us to ascribe the stars to different moving groups and to analyze the chromospheric activity/rotation/age relationships in groups of stars with different ages. Identification of a significant number of late-type members of these young moving groups would be extremely important for a study of the chromospheric and coronal activity and their age evolution, and could lead to a better understanding of star formation history in the solar neighborhood discerning between field-like stars (associated with dynamical resonances (bar) or spiral structure) and young coeval stars (debris of star-forming aggregates in the disk). In addition, this sample of FGMK stars include several well known exoplanets-hots stars and constitute the natural places to look for the presence of exoearths with next generation NIR spectrographs and space missions. An optimal knowledge of the host stars is required to infer the nature, formation and evolution of planets and to characterize planetary atmospheres and to carry out comparative planetology.

2.4.5 (1730 hrs) **The Butterfly Diagram Leopard Skin Pattern**

Maurizio Ternullo
INAF - Osservatorio Astrofisico di Catania, Catania, Italy

The Butterfly Diagram (BD) describes - in its original form - the sunspot cycle giving, for any Carrington rotation and latitude, the dicothomous information "there is/there is not a spotgroup". Accordingly, theoretical models constrained by a phenomenological scenario so poorly defined can give but qualitative predictions, in spite of their complexity.

I present a BD showing the spotted area distribution in cycles 12-23; it comes from a numerical array formed by the average values of the spotted area at any Carrington rotation and latitude, visualized as a set of level curves. This approach reveals that the spotted area distribution is higly dishomogeneous, most of it being concentrated in few, small portions ("knots") of the BD; because of this structure, the BD may be properly described as a cluster of knots. A knot may appear at either lower or higher latitudes than previous ones, in a seemingly random way; accordingly, the spot mean latitude abruptly drifts equatorward or even poleward at any knot activation,
in spite of any smoothing procedure.

The description, assuming that spots scatter around the "spot mean latitude" steadily drifting equatorward, is challenged: spots cluster around as many latitudes as knots; accordingly, the "spot mean latitude" is an arithmetic artefact which does not necessarily correspond to the spot maximal-density site. Indeed, in a relevant number of cases, knots appear to be arranged in two roughly rectilinear, parallel, oblique streams, the "spot mean latitude" being located in the underspotted band lying between these streams.

2.4.6 (1745 hrs) **Turbulence and magnetic spots at the surface of hot massive stars**

Matteo Cantiello[1], Jonathan Braithwaite[1], Axel Brandenburg[2], Fabio Del Sordo[2], Petri Käpylä[3]
[1]Argelander Institute for Astronomy, Bonn, Germany, [2]Nordita, Stockholm, Sweden, [3]University of Helsinki, Helsinki, Finland

The common wisdom is that the envelope of massive main sequence stars is radiative. However OB stars can develop convective regions close to the surface (subsurface convection, Cantiello et. al 2009), due to the opacity peak associated with iron ionization. We study the occurrence of subsurface convection in the upper HR diagram using stellar evolution models as well as 3D MHD simulations of subsurface convection zones. We discuss possible correlations with observable phenomena at the stellar surface. We compare observations and predictions of small scale motion induced by the subsurface convection zone. Since early type stars are usually fast rotators, we suggest that a dynamo process could be at work in these subsurface convection regions, and that magnetic fields could appear at their surface. We discuss possible implications for magnetic spots on hot stars.

3. Wednesday, 25 August 2010: The Atmospheric Connection

Session 3.1 (0800 – 1000 hrs): Sunspots
Chair: R. Komm

3.1.1 (0800 hrs) **Coronal heating at null points and separators***

Klaus Galsgaard
Niels Bohr Institute, Copenhagen, Denmark

The photospheric magnetic field persist of a complex mixture of positive and negative polarity flux concentrations. Models extending this source boundary in to a coronal reveals a complicated magnetic field in which numerous 3D magnetic null points exist. 3D null points are known locations of magnetic reconnection,
converting free magnetic energy into heat, kinetic energy and particle acceleration. An open question relates to the role 3D null points play in the heating of the corona, Do they have a significant role, or are their role more indirect facilitating other regions with the ability to release free magnetic energy? In this talk I will look at the basic ways energy may be released in 3D null points and look their influence on the energy release in more global scenarios.

3.1.2 (0825 hrs) **Velocity Fields in and around Sunspots at the Highest Resolution***

Carsten Denker
Astrophysikalisches Institut Potsdam, An der Sternwarte 16, 14482 Potsdam, Germany

The flows in and around sunspots are rich in detail. Starting with the Evershed flow along lowlying flow channels, which are cospatial with the horizontal penumbral magnetic fields, Evershed clouds may continue this motion at the periphery of the sunspot as moving magnetic features in the sunspot moat. Besides these well-ordered flows, peculiar motions are found in complex sunspots, where they contribute to the build-up or relaxation of magnetic shear along magnetic neutral lines. In principle, the three-dimensional structure of these velocity fields can be captured. The line-of-sight component of the velocity vector is accessible with spectroscopic measurements, whereas local correlation or feature tracking techniques provide the means to assess horizontal proper motions. The next generation of ground-based solar telescopes will provide spectropolarimetric data resolving solar fine structure with sizes below 50 km. Thus, these new telescope with advanced post-focus instruments act as a “zoom lens” to study the intricate surface flows associated with sunspots. Accompanied by “wide-angle” observations from space and complemented by “subsurface imaging” using (local) helioseismology, we have now the opportunity to describe sunspots as a system. This review reports on the progress in observational techniques, highlights the role of advanced instrumentation in the discovery process, and discusses the impact of recent findings on the theory of sunspots.

3.1.3 (0850 hrs) **Modeling solar coronal magnetic fields***

Thomas Wiegelmann
MPS, Katlenburg-Lindau, Germany

Accurate routine measurements of the magnetic field vector are only available in the photosphere, e.g., from the SDO/HMI vector magnetograph. To get insights into the magnetic field structure in higher layers of the solar atmosphere, one has to combine the photospheric measurements with model assumptions. Here we concentrate on models for the solar coronal magnetic field. A helpful property of the coronal plasma is that the magnetic pressure is several orders higher as the plasma pressure. Consequently non-magnetic forces like plasma pressure gradients and gravity can be neglected in lowest order. This leads to the so called 'force-free field' assumption. Force-free fields require a vanishing Lorentz-force. This can be fulfilled either by a vanishing electric current (leading to potential field models) or requires that the currents are parallel or anti-parallel to the magnetic field. In the generic case the relation between currents and magnetic fields are not linear. The resulting nonlinear force-free field models (NLFFF) are the currently used most sophisticated approach to model the magnetic field in the corona. We outline several numerical approaches to solve the corresponding nonlinear equations. A difficulty is that the measured photospheric magnetic fields are not force-free, due to the finite beta plasma in the solar photosphere. This requires 'preprocessing' of the measured fields in order to make them suitable as boundary condition for NLFFF-models. The resulting 3D coronal magnetic field models can be compared with coronal images, e.g. from SDO/AIA because the coronal plasma outlines the magnetic field lines. Time series of NLFFF-equilibria are used to study quantities like the magnetic energy and in particular the stored free energy, which can be released during flares and coronal mass ejections.

3.1.4 (0915 hrs) **Evolution of twist-shear and dip-shear in a flaring delta-sunspot: Hinode observations**

Sanjay Gosain, P Venkatakrishnan
Udaipur Solar Observatory, Physical Research Laboratory, Udaipur 313001, India

The non-potentiality of solar magnetic field can be resolved into two components i.e., the twist-shear and dip-shear component. The former has been studied traditionally in terms of the angle between the observed and potential transverse component of the magnetic field. Similarly, the dip-shear component can be studied in terms of the difference between the inclination angle of the observed and the transverse field vector. We evaluate the dip-shear component in a delta-sunspot which had a highly twisted configuration and lead to a highly energetic X-class flare on 13 December 2006 in NOAA 10930. The region was observed with very high angular resolution by the SOT/SP instrument on-board the Hinode spacecraft. The results about the evolution of twist and dip-shear in relation to flare, using a sequence of high-quality vector magnetograms from space, will be presented.

3.1.5 (0930 hrs) **What Determines the Penumbral Size and Evershed Flow Speed?**

***Na Deng*[1], *Toshifumi Shimizu*[3], *Debi Prasad Choudhary*[1], *Haimin Wang*[2]**

[1]California State University Northridge, Northridge, CA, United States, [2]New Jersey Institute of Technology, Newark, NJ, United States, [3]Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency (ISAS/JAXA), Sagamihara, Kanagawa, Japan

Recent observations (e.g., Wang et al. 2004; Deng et al. 2005) have shown that there is a sudden penumbral decay associated with major flares during which the overall magnetic field inclination in penumbra changes due to magnetic reconnection. We propose that the size (i.e., length) of sunspot penumbra is related to the magnetic field configuration. In order to test this hypothesis, we study more than 10 simple sunspots close to disk center with different sizes, which were observed by Hinode/SOT at the late phase of solar cycle 23. We notice that even for typical alpha sunspots near the disc center, the penumbral length is different in different sectors in the same spot. Since the Evershed flow is coupled with penumbra, we also study the properties of Evershed flow, such as its speed, at different location of a sunspot. The SP data is used to study the magnetic field parameters (e.g., strength, inclination) in different penumbral sectors. The Evershed flow is measured by Local Correlation Tracking based on time series of BFI data. We aim to find the relationship among magnetic field topology, penumbral size, and Evershed flow speed.

3.1.6 (0945 hrs) **In-depth survey of sunspot and active region catalogs**

***Laure Lefevre*[1], *Frédéric Clette*[1], *Tunde Baranyi*[2]**

[1]SIDC - Royal Observatory of Belgium, Brussels, Belgium, [2]Heliophysical Observatory of the Hungarian Academy of Sciences, Debrecen, Hungary

When consulting detailed photospheric catalogs for solar activity studies spanning long time intervals, solar physicists face multiple limitations in the existing catalogs: finite or fragmented time coverage, limited time overlap between catalogs and even more importantly, a mismatch in contents and conventions. In view of a study of new sunspot-based activity indices, we have conducted a comprehensive survey of existing catalogs and we produced a comparative matrix of their contents. We show where they overlap, allowing partial cross-validation and we also pinpoint the various discrepancies that make them either mutually incompatible or have so far discouraged conversion efforts, given the insufficient past processing capabilities.

In a first approach, we illustrate how the information from parallel catalogs can be merged to form a much more comprehensive record of sunspot groups. For this, we use the unique Debrecen Photoheliographic Data (DPD), which is already a composite of several ground observatories and SOHO data, and the USAF/Mount Wilson data from the Solar Optical Observing Network (SOON).

We also describe our semi-interactive cross-identification method, which was needed to match the non-overlapping solar active region nomenclature, the most critical and subtle step when working with multiple catalogs. This effort, focused here first on the last two solar cycles, should lead to a better central database collecting all available sunspot group parameters to address future solar cycle studies beyond the traditional sunspot index time series Ri.

Session 3.2 (1020 – 1220 hrs): Sunspots
Chair: Carsten Denker

3.2.1 (1020 hrs) **The Sun at high resolution: first results from the Sunrise mission***

Sami K. Solanki

Max-Planck-Institute for Solar System Research, Katlenburg-Lindau, Germany

The magnetic field at the surface of the Sun is concentrated in magnetic features that often have spatial extents of 100 km or less. It is likely that the same processes that act on the Sun to concentrate the field and determine its properties and dynamics at such small scales are also acting on other late-type stars. Whereas clever techniques are increasingly allowing more to be learnt about the large-scale distribution of the magnetic field on the surfaces of cool stars, the small-scale structure, driven generally by interactions between field, radiation, convection and waves, can only be deduced from the Sun. Even on the Sun the study of the fine-scale structure of the magnetic field has been hampered by the limited spatial resolution of the available observations. This has recently changed. In particular, the Sunrise observatory, harboring the largest solar telescope to leave the ground, has been able to resolve concentrated magnetic fields in the Sun's photosphere, even in the quiet Sun. In addition, the unique data obtained by Sunrise have resulted in a number of further discoveries and results. After a brief introduction to the Sunrise mission, an overview of the most important of these results will be given.

3.2.2 (1045 hrs) **Review of discoveries from Hinode***

Saku Tsuneta

National Astronomical Observatory, Tokyo, Japan

It is a fascinating fact that a solitary star like the Sun emits intense X-rays from its outer atmosphere. Observations with the Japan-US Yohkoh satellite showed that all the sporadic heating from X-class flares to ubiquitous tiny bursts in the solar corona is due to magnetic reconnection. These activities on the surface of the star are driven by magnetic fields created by the interaction of flow and seed magnetic fields below the photosphere. The magnetic field strength on the surface of the Sun exceeds 1kG. They are stronger than the equi-partition magnetic field strength, the energy of which is the same as that of the local convection motion. Hinode has higher temporal, spatial and velocity resolution than any satellite previously and is probing wavelength regimes that have never had such continuous time coverage available. This has allowed us to discover MHD waves in spicules, prominences and in the photosphere, ubiquitous jets in chromospheres, ubiquitous transient horizontal magnetic fields on the photosphere suggesting local dynamo process, supersonic down-flow and convective collapse resulting in super equi-partition magnetic field strength, emergence of large-scale flux rope from below the photosphere, kG-magnetic patches in the polar regions,

identification of the origin of slow solar wind, and enigmatic fine-scale flows in the prominence. This talk summarizes how these new results from Hinode are addressing fundamental physical processes that will have applications in many other scenarios in stars.

3.2.3 (1110 hrs) **Coronal flaring and heating in quasi-separatrix layers***

Guillaume Aulanier
Observatoire de Paris, LESIA, Meudon, France

The seminal flare and DC coronal heating models have historically been built in the frame of the 2D reconnection theory at X-points. As being driven by increasingly detailed observations, solar physicists have started to immerse into the overwhelming wealth of 3D geometries supporting reconnection, and in the analyzis of their consequences for flares and coronal heating. Among these geomtries, quasi-separatrix layers (QSL) seem to be ubiquitous. QSLs naturally occur around the remnants of separators when the surface magnetic fields are modeled by a continuous flux distribution. Also it has recently been shown that QSLs form halos even around true separatrices emanating from non-axisymetric 3D null points. Based on MHD simulations, I will show that narrow current sheets spontaneously form along 3D QSLs, and eventually lead to magnetic reconnection. I will then describe and explain the slipping nature of reconnecting field lines in QSLs, and I will argue that it can differ from mere diffusion for super-Alfvénic slipping. I will present applications for the evolution of EUV flare ribbons as observed by TRACE and SDO, both in the wake of coronal mass ejections and on the side of emerging flux regions, and for the injection of sweeping particle beams in interchange reconnection. I will also elaborate on the role of QSL reconnection in the Parker and turbulent models for coronal heating. I will finally discuss why null point and separator reconnection must involve QSLs as well, and I will show HINODE and SDO observations of slipping loops and QSL current sheet formation.

3.2.4 (1135 hrs) **3D numerical modeling of the trigger of jets above magnetic sunspots**

***Etienne Pariat*[1], *Spiro K. Antiochos*[2], *C. Rick Devore*[3]**
[1]LESIA - Observatoire de Paris, Paris, France, [2]NASA GSFC, Greenbelt, MD, United States, [3]Naval Research Laboratory, Washington, DC, United States

Sunspots are the sites of the most dynamic features of the solar atmosphere. Jet-like phenomena are typical dynamical events observed in the vicinity of sunspots. At small scale, jets are observed in the close vicinity of the spot umbra, in region of small mixed polarities. Jets are also continuously triggered in coronal holes, over large magnetic field concentration. Jets appear to be inherent features resulting from the interaction of magnetic concentrations with their surroundings.

The present talk will focus on the trigger of such coronal jets. I will present the results of a series of 3D MHD numerical simulations performed with our state-of-art adaptive mesh MHD solver ARMS. Multiple recurring helical jets are triggered through magnetic reconnection between the magnetic spot field and the surrounding field inducing nonlinear Alfvenic waves. I will finally discuss how the 3D topological structure of the magnetic field of the spot plays a key role in the generation process of the jet events.

3.2.5 (1150 hrs) **A New Sunspot Chromospheric Model Based on the SUMER EUV Spectrum**

Eugene Avrett
Harvard-Smithsonian Center for Astrophysics, Cambridge, MA 02138, United States

We present a new model of the chromosphere above a sunspot based on the EUV spectrum between 66.8 and 147.5 nm of a large sunspot near disk center given in the SUMER atlas of Curdt et al. (1999). The spectrum consists of emission lines together with an underlying continuum, and is formed in the sunspot chromosphere and corona. To obtain the chromospheric model we have solved the coupled set of non-LTE equations for the atoms and ions of H, He, C, N, O, Ne, Na, Mg, Al, Si, S, Ca, and Fe. The temperature as a function of height is determined by empirical adjustments to obtain agreement between the calculated and observed underlying continuum. We have found a temperature vs. height that gives a calculated continuum distribution over the 66.8-147.5 range that agrees reasonably well with the observed underlying continuum. This temperature distribution is determined within narrow limits: changing the temperature by 100 K typically leads to an intensity change by a factor of 2. This match to the observed underlying continuum establishes the model from just above the temperature minimum to the onset of the chromosphere-corona transition region. The next step is to match calculated and observed emission lines. We are currently using the chromospheric model, established from the observed underlying continuum, to see how well we can match the observed chromospheric emission lines, with the aim of determining, or placing limits on, abundances and various rates and cross sections.

3.2.6 (1205 hrs) **Derivation of 3D magnetic topology of solar active regions from 2D magnetograms using stereoscopy of rotation**

Antonio Pasqua
University of Manchester, Manchester, United Kingdom

Phenomena of the Solar Activity are caused by topological variation of magnetic field related to Active Regions. The interpretation and the modelling of these phenomena cannot have to do without the knowledge of the tri-dimensional magnetic topology, that spread in the Solar Corona starting from the Photosphere. On the other hand, the measure of magnetic field of the Active Regions is limited at the longitudinal component at photospheric level and from this component with different methods we can extrapolate the tri-dimensional configuration at higher heights. Consolidate numerical methods are based on the tri-dimensional solution of MHD equation and this imply a long time of calculation also for a region of limited extension. If we consider force-free and quasi-static coronal field, an analytical and numerical method recently proposed allow us to reconstruct the magnetic field starting from observations in different times of the longitudinal component, using stereoscopy of

rotation, in a shorter time.

The purpose of my work is the application to different cases of a numerical code, written in IDL language at the INAF-OATs, that implement the stereoscopic method to verify its functionality and the physical congruity of 3D topology reconstructions.

Session 3.3 (1340 – 1555 hrs): Starspots
Chair: Tom Ayres

3.3.1 (1340 hrs) **Modeling stellar coronal magnetic fields***

Moira Jardine
University of St Andrews, Fife, United Kingdom

Our understanding of the structure and dynamics of stellar coronae has changed dramatically with the availability of surface maps of both star spots and also magnetic field vectors. Magnetic field extrapolations from these surface maps reveal surprising coronal structures for stars whose masses and hence internal structures and dynamo modes may be very different from that of the Sun. Crucial factors are the fraction of open magnetic flux (which determines the spin-down rate for the star as it ages) and the location and plasma density of closed-field regions, which determine the X-ray and radio emission properties. In this talk I will describe recent progress in modelling stellar coronae, in particular the relative contributions of the field detected in the bright surface regions and the field that may be hidden in the dark star spots. For the Sun, the relationship between the field in the spots and the large scale field is well studied over the solar cycle. It appears, however, that other stars can show a very different relationship.

3.3.2 (1405 hrs) The spots on Ap stars*

Oleg Kochukhov
Uppsala University, Uppsala, Sweden

The upper main sequence magnetic chemically peculiar (Ap) stars exhibit a non-uniform distribution of chemical elements across their surfaces and with height in their atmospheres. These inhomogeneities, responsible for the conspicuous photometric and spectroscopic variations of Ap stars, are believed to be produced by the magnetically controlled atomic diffusion, operating in the stellar atmospheres stabilized by multi-kG magnetic fields. In this talk I will present an overview of the current state-of-the-art in understanding the physics of Ap-star spots and their relation to magnetic fields. In particular, I will summarize recent studies of the 3-D chemical spot structures and present magnetic field mapping results based on the full Stokes vector spectropolarimetry of these stars. I will also discuss a new type of early-type spotted stars, in which dynamical chemical structure formation is driven by a poorly understood mechanism seemingly unrelated to magnetic fields.

3.3.3 (1430 hrs) **Inversion Techniques for Stellar Magnetic Fields and Starspots -- On the Incoherence of DI and ZDI***

Thorsten A. Carroll
Astrophysikalisches Institut Potsdam, Potsdam, Germany

Doppler-Imaging (DI) is a reliable technique to detect and map the temperature inhomogeneities on the surface of moderate and rapid rotating stars. DI maps have revealed that the surface topologies of many rapid rotating stars are quite different from what we know from the Sun, with high latitudes or polar starspots. Although it is not clear if these features are monolithic entities or just unresolved conglomerates, the magnetic filling factor is significant.

Polarimetry of rapid rotating stars should be able to detect some of the fields within these starspot features and Zeeman-Doppler Imaging (ZDI) as a technique to reconstruct the surface magnetic field from spectropolarimetric observation could in principle be a viable tool. But still, the majority of DI and ZDI maps are only partly or weakly correlated and it seems that they trace different surface structures. ZDI apparently receives its main contribution from warmer or hotter surface regions, despite the fact that we expect the stronger fields within the starspot features. In a number of model simulations I show that the often invoked explanation of a reduced photon flux within starspots or the mixture of magnetic polarities can not always explain the incoherency between DI and ZDI maps, but instead inherent problems in the inversion process contribute to this problem. I will introduce improvements in the inversion procedure as well as in the types of spectral lines used in the preprocessing and reconstruction step to catch a little more of the otherwise missed magnetic flux from the starspot regions.

3.3.4 (1455hrs) **FR Cnc: Revisited. Photometry, Polarimetry and Spectroscopy**

Alex Golovin[1], Mari Cruz Galvez-Ortiz[2], M. Hernan-Obispo[3], M. Andreev[4], J.R. Barnes[2], D. Montes[3], E. Pavlenko[5], J.C. Pandey[6], R. Martinez-Arnaiz[3], B.J. Medhi[6], P.S. Parihar[7], A. Henden[8], A. Sergeev[4], S. Zaitsev[1], N. Karpov[4]
[1]Main Astronomical Observatory of National Academy of Sciences of Ukraine, Kiev, Ukraine, [2]Center for Astrophysics Research, University of Hertfordshire, College Lane, Hatfield, Hertfordshire, United Kingdom, [3]Astrophysics department, Physic Faculty, Universidad Complutense de Madrid, Madrid, Spain, [4]Terskol Branch of Institute of Astronomy RAS, Terskol, Russian Federation, [5]Crimean Astrophysical Observatory (CrAO), Nauchny, Ukraine, [6]Aryabhatta Research Institute of Observational Sciences (ARIES), Manora Peak, Nainital, India, [7]Indian Institute of Astrophysics, Bangalore, India, [8]AAVSO, Clinton B. Ford Astronomical Data and Research Center, Cambridge, United States

This is part of multiwavelength study aimed at use complementary photometric, polarimetric and spectroscopic data to obtain a complete understanding of the activity process in late type stars. We present here the study of FR Cnc, young active spotted star. The objective of this work is to make a complete characterization of the star
by carrying out study of the optical indicators of chromospheric activity, studying photospheric variability and obtaining the photospheric-

chromospheric activity relation. We obtained low and high resolution echelle spectroscopic observations at various observatories during observing runs from 2004 to 2008, we carried out photometric observations at Terskol Observatory (Russia) between 2007 and 2008, and polarimetric observations in 2007 at ARIES (India). We calculated radial velocities via cross correlation with radial velocity standard stars and studied the star kinematic galactic space-velocity components (U, V, W) and applying different membership criteria. We obtained by analysis of ASAS-3 lightcurves an improved photometric period of 0.826518 days and monitored the photometric variations during 2002-2008 years. Finally, we determined the chromospheric contribution in optical spectroscopic indicators, from Ca_{II} H & K to Ca_{II} IRT lines, using the spectral subtraction technique and we performed a doppler imaging study. We found that this star present unusual variability in short time-scale and it is seems that there exist a fast event of redistribution of activity features on the surface. Also we found an unusual distribution of the spots for stars of this spectral type, that with their fast redistribution might indicate a change in the dynamo geometry.

3.3.5 (1510 hrs) **Stellar active longitudes and flip-flops from the space and ground-based observations**

Igor Savanov
Institute of Astronomy of the Russian Academy of Sciences, Moscow, Russian Federation

We present the results of the light-curve inversions obtained from the observations with ground-based and space telescopes. Our maps of the stellar surface-temperature inhomogeneities were obtained without a priori assumptions about the shape, configuration and number of spots. A model of a spotted star with two types of surface inhomogeneities-spots and related plage fields was also investigated. Two active longitudes and flip-flops determined from the maps of stars of different types (solar analogues, RS CVn stars, FK Com and T Tau stars) seem to be typical patterns of stellar activity.

3.3.6 (1525 hrs) **Surface appearance of dynamo-generated large-scale fields**

Jörn Warnecke, Axel Brandenburg
Nordita, Stockholm, Sweden

Twisted magnetic fields are frequently seen to emerge above the visible surface of the Sun. This emergence is usually associated with the rise of buoyant magnetic flux structures. Here we ask how magnetic fields from a turbulent large-scale dynamo appear above the surface if there is no magnetic buoyancy. The computational domain is split into two parts. In the lower part, which we refer to as the turbulence zone, the flow is driven by an assumed helical forcing function leading to dynamo action. Above this region, which we refer to as the exterior, a nearly force-free magnetic field is computed at each time step using the stress-and-relax method. A twisted arcade-like field structure is found to emerge in the exterior above the turbulence zone. Strong current sheets tend to be formed above the neutral line, where the vertical field component vanishes. Time series of the magnetic field structure show recurrent plasmoid ejections. The degree to which the exterior field is force-free is estimated as the ratio of the dot product of current density and magnetic field strength to their respective rms values. This ratio reaches values of up to 95% in the exterior. A weak outward flow is driven by the residual Lorentz force.

3.3.7 (1540) **The Optical/NUV Continuum Properties of M Dwarf Flares**

Adam Kowalski[1], Suzanne Hawley[1], Jon Holtzman[2], John Wisniewski[1], Eric Hilton[1], Sarah Schmidt[1]
[1]University of Washington, WA, United States, [2]New Mexico State University, NM, United States

The primary mode of radiative energy release in stellar flares is in the optical and near-ultraviolet (NUV) continuum. This white light radiation carries as much as 80-90% of the total radiated flare energy. However, radiative hydrodynamic models of stellar flares using a solar flare paradigm and the sparse observations of solar and stellar flare continua are all seemingly in disagreement over the type(s) of emission that contribute to the optical/NUV continuum during flares. We have begun a long-term spectroscopic flare monitoring campaign to fully characterize the optical/NUV white light continuum emission on short timescales for large and small flares. To date, our most significant results come from spectroscopic (3350A – 9260A) and photometric (U band) observations during 1.3 hours of the decay phase of a megaflare on the dM4.5e star YZ CMi, where we have detected two distinct continuum components that contribute to the white light from 3350A – 4800A. We present a time-resolved spectral analysis of the continuum components and emission lines for this flare and for several other flares obtained during our spectroscopic monitoring campaign. We also discuss how these data provide critical constraints for the next generation of stellar flare models.

4. Thursday, 26 August 2010: "Global" Stellar Activity?

Session 4.1 (0800 – 1000 hrs): Starspots
Chair: S. Jeffers

4.1.1 (0800 hrs) **The magnetic field in starspots***

Svetlana Berdyugina
Kiepenheuer Institut fuer Sonnenphysik, Freiburg, Germany

Sunspots are the primary evidence of solar activity, and they harbour the strongest field and the coldest plasma on the solar surface. Their stellar analogues were first detected on cool, red dwarfs from periodic dimming of the star's brightness as it rotates huge dark "starspots" into view. Such a phenomenon is common among stars possessing convective envelopes, where magnetic fields are believed to be generated. However, until recently magnetic fields have not been measured inside starspots, and their internal structure was unknown. The first three-dimensional view of magnetic fields inferred from spectropolarimetric observations reveals strong magnetic fields in and outside starspots. The starspots, comprising single-polarity fields expand with height while their temperature and

magnetic field strength decrease, with the gradient dB/dT being larger than in sunspot umbra. The strong entangled field outside spots is apparently confined to the lower atmosphere. This first view of the vertical structure of stellar magnetic fields provides important new clues for the theory of both solar and stellar magnetism.

4.1.2 (0825 hrs) **Stellar Activity and Brightness Variations: Results from Bright Solar Analogs and Future Directions***

Jeffrey Hall, Wes Lockwood
Lowell Observatory, Flagstaff, AZ, United States

Synoptic observations of stellar activity cycles have been undertaken for more than 40 years, starting with the inception of the Mount Wilson HK project in 1966. Since the 1980s, the stellar HK observations have been usefully complemented by photometric brightness measurements in b and y. These contemporaneous activity and brightness data have provided guidance regarding the likely excursion of solar variability on century and millennial timescales, especially during low activity or grand minimum states, as well as the frequency of occurrence of grand minima among Sun-like stars. Recent solar spectral irradiance results, however, complicate the interpretation of the direct activity-brightness relationships found in solar-age Sun-like stars. A further problem is the paucity of good solar twins bright enough to be accessible to current long-term programs. In this talk I will review the results to date for both the Mount Wilson stars and the sample of solar analogs now being monitored at Lowell Observatory, and will discuss how synoptic stellar programs will likely best support our understanding of solar total and spectral irradiance variations as Cycle 24 develops.

4.1.3 (0850 hrs) **Sunspots at Centimeter Wavelengths***

Mukul Kundu, Jeongwoo Lee
Dept of Astronomy, University of Maryland, College Park, MD, United States

The early solar observations of Covington (1947) established a good relation between 10.7 cm solar flux and the presence of sunspots on solar disk. The first spatially resolved observation with a two-element interferometer at arc-min resolution by Kundu (1959) found that the radio source at 3 cm has a core-halo structure; the core is highly polarized and corresponds to the umbra of a sunspot with magnetic fields of several hundred gauss, and the halo corresponds to the diffuse penumbra or plage region. The coronal temperature of the core was interpreted as due to gyroresonance opacity produced by acceleration of electrons gyrating in a magnetic field. Since the opacity is produced at resonant layers where the frequency matches harmonics of the gyrofrequency, the radio observation could be utilized to measure the coronal magnetic field. Since this simple interferometric observation, the next step for solar astronomers was to use arc second resolution offered by large arrays at cm wavelengths such as Westerbrock Synthesis Radio Telescope and the Very Large Array, which were primarily built for cosmic radio research. Currently, the Owens Valley Solar Array operating in the range 1-18 GHz and the Nobeyama Radio Heliograph at 17 and 34 GHz are the only solar dedicated radio telescopes. Using these telescopes at multiple wavelengths it is now possible to explore three dimensional structure of sunspot associated radio regions and therefore of coronal magnetic fields. We shall present these measurements at wavelengths ranging from 1.7 cm to 90 cm and associated theoretical developments.

4.1.4 (0915 hrs) **Global Magnetic Cycles in Rapidly Rotating Younger Suns**

Nicholas Nelson[1], Benjamin Brown[2], Matthew Browning[3], Sacha Brun[4], Mark Miesch[5], Juri Toomre[1]
[1]JILA, University of Colorado at Boulder, Boulder, CO, United States, [2]University of Wisconsin-Madison, Madison, WI, United States, [3]CITA, University of Toronto, Toronto, ON, Canada, [4]SaP, CEA Saclay, Gif-sur-Yvette, France, [5]HAO, NCAR, Boulder, CO, United States

Observations of sun-like stars rotating faster than our current sun tend to exhibit increased magnetic activity as well as magnetic cycles spanning multiple years. Using global 3-D MHD simulations to study the coupling of large-scale convection, rotation, and magnetism in a younger sun, we have probed effects of more rapid rotation on stellar dynamos and the nature of magnetic cycles. Our anelastic spherical harmonics (ASH) code allows study of the convective envelope, occupying the outer 30% by radius of a sun-like star. Major simulations carried out at three times the current solar rotation rate reveal magnetic dynamo action that can produce wreaths of strong toroidal magnetic field at low latitudes, often with opposite polarity in the two hemispheres. The presence of the wreaths is quite surprising, for they arise as quite persistent global structures amidst the vigorous and turbulent convection. Our recent simulations have explored behavior in systems with considerably lower diffusivities, achieved with several sub-grid scale models including a dynamic Smagorinsky treatment of unresolved turbulence. The decreased levels of diffusion creates magnetic wreaths that undergo prominent variations in field strength, even exhibiting global magnetic cycles that involve polarity reversals. Supercomputing allows us to consider evolution over thousands of rotation periods, showing that some of the reversals are rather chaotic whereas others are more regular with cycles that span multiple years. These simulations serve to assess dynamo processes that both build the fields and lead to reversals in these models of younger suns.

4.1.5 (0930 hrs) **Magneto-hydrostatic equilibrium in starspots: dependences on color (T_eff) and surface gravity (g)**

S.P. Rajaguru, S.S. Hasan
Indian Institute of Astrophysics, Bangalore, Karnataka, India

Temperature contrasts and magnetic field strengths of sunspot umbrae broadly follow the thermal-magnetic relationship obtained from magnetohydrostatic equilibrium. Using a compilation of recent observations, especially in molecular bands, of temperature contrasts of starspots in cool stars, and a grid of Kurucz stellar model atmospheres constructed to cover layers of sub-surface convection zone, we examine how the above relationship scales with effective temperature (T_eff), surface gravity g and the associated changes in opacity of stellar photospheric gas. We calculate expected field strengths in starpots and, by combining Zeeman broadening measurements in cool stars that pertain to

small scale bright features, examine ways of reconciling the stellar observations using the known physics of the solar case. The apparently increasing B values from Zeeman broadening measurements in cooler stars (i.e. as T_eff decreases), in disagreement with the decreasing sub-surface superadiabaticity (as calculated from Kurucz models that use improved mixing length description), is suggested to be due to increasing contributions from spots of decreasing temperature contrasts in these stars. We also discuss the implications of these results for activity related photospheric brightness variations and their correlation with other higher atmospheric activity measures.

4.1.6 (0945) **Disentangling stellar activity and planetary signals**

***Isabelle Boisse*[1], François Bouchy[2], Guillaume Hébrard[1], Xavier Bonfils[3], Nuno Santos[4], Sylvie Vauclair[5]**

[1]Institut d'Astrophysique de Paris, Paris, France, [2]Observatoire de Haute-provence, St Michel L'observatoire, France, [3]LAOG, Grenoble, France, [4]Centro de Astrofisìca, Porto, Portugal, [5]LATT, Toulouse, France

Photospheric stellar activity (i.e. dark spots or bright plages) might be an important source of noise and confusion in the radial-velocity (RV) measurements. Radial-velocimetry planet search surveys as well as follow-up of photometric transit surveys require a deeper understanding and characterization of the effects of stellar activities to disentangle it from planetary signals. We simulate dark spots on a rotating stellar photosphere. The variations of the photometry, RV and spectral line shapes are characterized and analyzed according to the stellar inclination, the latitude and the number of spots. The Lomb-Scargle periodograms of the RV variations induced by activity present power at the rotational period Prot of the star and its two-first harmonics Prot/2 and Prot/3. Three adjusted sinusoids fixed at the fundamental period and its two-first harmonics allow to remove about 90% of the RV jitter amplitude. We apply and validate our approach on four known active planet-host stars: HD189733, GJ674, CoRoT-7 and iotaHor. We succeed in fitting simultaneously activity and planetary signals on GJ674 and CoRoT-7. We excluded short-period low-mass exoplanets around iotaHor. Our approach is efficient to disentangle reflex-motion due to a planetary companion and stellar-activity induced-RV variations provided that 1) the planetary orbital period is not close to that of the stellar rotation or one of its two first harmonics, 2) the rotational period of the star is accurately known, 3) the data cover more than one stellar rotational period.

Session 4.2 (1020 – 1220 hrs): Starspots and Sunspots
Chair: S. Saar

4.2.1 (1020 hrs) **Global MHD phenomena and their importance for stellar surfaces***

Rainer Arlt

Astrophysikalisches Institut Potsdam, Potsdam, Germany

The current modelling of stellar dynamos involves two branches: one is the multitude of possible solutions of mean-field dynamos; the other is the direct generation of large-scale magnetic fields from simulations of magnetohydrodynamic turbulence. The former can model a full star, but have to rely on the validity of the mean-field assumptions. The latter is limited to local studies at present, but those are about to deliver the key to the understanding of large-scale dynamo action. The talk will focus on global MHD phenomena and resulting magnetic fields near the stellar surface. These include magnetic instabilities other than dynamos whose relations need to be understood for valid models of stellar magnetism. The prospects of a full MHD description will also be discussed in this review.

4.2.2 (1045 hrs) **The Ups and Downs of Alpha Centauri***

Thomas Ayres

University of Colorado, Boulder, CO, United States

The main pair (G2V ["A"] and K1V ["B"]) of the nearby Alpha Centauri system have the mosr extensive coronal X-ray record of any late-type star, besides the Sun itself. The binary has been intensively monitored by Chandra and XMM-Newton since late-1999, with semiannual measurements from 2003 onward. Earlier, ROSAT carried out several campaigns on Alpha Cen in the 1990's. Although the two stars were widely enough separated in the early part of the decade to be successfully imaged by XMM (10" resolution), the orbit has been closing rapidly the past several years, and now can only be resolved by the sharper 1" gaze of Chandra. The Chandra High Resolution Camera also has an additional advantage of being sensitive to the X-ray soft state that sun-like stars achieve during minima of their starspot cycles. Alpha Cen A has displayed a nearly constant, low X-ray luminosity during 2003-2010, although according to the most recent Chandra pointing (May 2010), it appears to be rising out of the extended minimum (paralleling the Sun's own recovery from its recent "Eddy Minimum"). Meanwhile, the companion, B, has exhibited a very clear 8-year cycle, and has been climbing out of minimum toward a maximum in the 2011-12 timeframe. The recent Chandra measurements will be discussed in the context of the historical X-ray timeseries of both stars, including new FUV spectra of the pair from Hubble (STIS) obtained in December 2009 and July 2010.

4.2.3 (1110 hrs) **The Structure and Evolution of the Global Solar Magnetic Field***

Duncan Mackay
University of St Andrews, St Andrews, Fife, United Kingdom

This review will discuss both observational and theoretical aspects of the Sun's Global Magnetic Field. First recent observations will be described along with the main physical processes leading to the time evolution and structure of the global field. Following from this, recent theoretical models of both the surface and coronal magnetic field will be presented. The application of these models to the formation of solar filaments, describing the onset and evolution of CMEs and finally the origin and variation of the Suns open flux will be discussed.

4.2.4 (1135 hrs) **Surface structure of selected Ap stars - Magnetic Doppler Imaging and a Bayesian approach to star spot modeling**

Theresa Lueftinger[1], Hans-Erich Fröhlich[2], Werner W. Weiss[1], Pascal Petit[3], Michel Auriere[3], Nicole Nesvacil[1], Michael Gruberbauer[1], Denis Shulyak[1], Evelyne Alecian[4], Annie Baglin[4], Frederic Baudin[7], Claude Catala[4], Jean-Francois Donati[3], Oleg Kochukhov[5], Eric Michel[4], Nikolai Piskunov[5], Thierry Roudier[3], Reza Samadi[4]
[1]Institute of Astronomy, University of Vienna, Türkenschanzstrasse 17, 1180, Vienna, Austria, [2]Astrophysikalisches Institut Potsdam, An der Sternwarte 16,, D-14482 Potsdam, Germany, [3]Laboratoire d'Astrophysique de Toulouse-Tarbes, Universit de Toulouse, CNRS, Toulouse, France, [4]Observatoire de Paris, LESIA, 5 place Jules Janssen, F-92195 Meudon Cedex, France, [5]Department of Physics and Astronomy, Uppsala University, 75120 Uppsala, Sweden, [6]Universite Pierre et Marie Curie, Universite Denis Diderot, Pl. J. Janssen, 92195 Meudon, France, [7]Institut d'Astrophysique Spatiale, UMR8617, Universite Paris X, Bat. 121, 91405 Orsay, France

Sophisticated techniques such as Doppler- and magnetic Doppler Imaging make it possible to directly assess abundance structures and magnetic field geometries on the surface of Ap stars, which are dominantly influenced by magnetic fields that are, in contrary to the fields of cool stars, globally organized and often very strong.

With the advent of highest quality photometric data obtained in space with Satellite missions like CoRoT, MOST, and Kepler, we are now in the position to fully exploit the high potential of combining high quality photometric data obtained in space, with results from ground based spectroscopy and spectropolarimetry.

Using a Bayesian approach to star-spot modeling, which in this work is applied the first time for the photometric mapping of a CP star, we derived longitudes, latitudes and radii of four different spot areas on the surface of the CoRoT Ap star HD 50773. The space observations triggered an extensive ground-based spectropolarimetric observing campaign using the NARVAL, ESPaDOnS, and SemelPol spectropolarimeters.

We will present the results from Doppler- and magnetic Doppler imaging, the correlation of chemical abundance and surface magnetic field structures and their close relation to findings obtained from Photometric Imaging (PI).

Further studies of Ap stars with a similar approach are currently ongoing and first results will be presented in the course of this conference.

Our studies significantly increase the sample of stars analysed in this way, which is crucial for modeling and understanding elemental diffusion in stars in the presence of a magnetic field.

Session 4.3 (1340 – 1555 hrs): Sunspots & Starspots
Symposium Summary
Chair: D. Choudhary

4.3.1 (1340 hrs) **Discovery of Solar Magnetism***

Jose Carlos del Toro Iniesta[1]
[1]IAA (CSIC), Granada, Spain, [2]IAC, La Laguna, Spain

4.3.2 (1415 hrs) **Symposium Summary: Sunspots***

Jim Klimchuk
NASA - GSFC

4.3.3 (1450 hrs) **Symposium Summary: Starspots***

Thomas Ayres
University of Colorado, Boulder, CO, United States

Poster Abstracts

1. Formation and decay of sunspots

0001 Solar activity and differential rotation

Hari Vats
Physical Research Laboratory, Ahmedabad, India

It is now believed that the sunspots and solar activity cycle through a complex manner are connected to the differential rotation of the Sun. The aim of this paper is to report the recent investigations of differential rotation during a solar cycle using radio images at 17 GHz and Yohkoh soft X-ray images. It is believed that these images reveal the processes and properties of the Sun's outer atmosphere mainly corona. The method employed in this is similar to what was used for the disk integrated radio flux at many radio frequencies to assess the differential rotation as a function of altitude in the solar corona. In this method we split the images with daily cadence in 17 bins along the solar longitude separated by 10^0 in latitude. Thus images of one year gives us a set of 17 time series which can be analyzed to estimate rotation period by correlation technique. The coronal sidereal rotation rate as a function of latitude for each year, extending from 1992 to 2001 for radio and soft X-ray images are obtained. The present analysis reveals that; (i) the equatorial rotation rate of the corona is comparable to the photosphere and the chromosphere, (ii) the latitude differential obtained by both radio and X-ray images is variable throughout the period of the study, and (iii) the equatorial rotation period seems to vary systematically with sunspot numbers and indicates its dependence on the phases of the solar activity cycle.

0002 Flare induced penumbra formation in the sunspot of NOAA 10838

Sreejith Padinhatteeri, Sankarasubramanian Kasiviswanathan
ISRO Satellite Center, Bangalore, India

Studies on the origin and evolution of small scale structures like penumbra, lightbridge and umbral dots of sunspots are crucial in understanding the sub-photospheric structuring in particular and the physics of sunspots in general. Formation and dynamical evolution of these small-scale structures are not well-understood fully. Observations of them are rare due to the difficulty in predicting the site and time of formation. We have observed formation of penumbrae on a pore in active region NOAA10838 using the Dunn Solar Telescope at NSO, Sunpot, USA. Simultaneous observations using different instruments are used to derive the vector magnetic field at the photosphere (from DLSP), intensity images (from G-band, CaK, and UBF) and Doppler velocity at different heights from photosphere to chromosphere (from UBF). Results from our analysis of this particular active region suggest that penumbrae are formed as a result of magnetic field reconfiguration which is triggered by a flare (observed at H- line core). The GOES measures the flare as C2.9. The observed vector magnetic fields show the re-orientation of fields and reduction in ,a measure of magnetic field twist. Our observations suggest that such reconfiguration of magnetic field structures due to a flare could be one of the way by which field lines fall back to the photosphere and form penumbrae as seen in the continuum wavelength.

0003 The Hemispheric Asymmetry of Solar Activity During the Last Century and the Solar Dynamo

Ashish Goel[1], Arnab Rai Choudhuri[1]
[1]Stanford University, Stanford, CA, United States, [2]Indian Institute of Science, Bangalore, Karnataka, India

The Babcock-Leighton process of poloidal field generation is expected to be the main source of irregularity in the solar cycle. The random nature of this process may make the poloidal field in one hemisphere stronger than that in the other hemisphere at the end of a cycle. This is expected to induce an asymmetry in the next sunspot cycle. We looked for evidence of this in the observational data and then modeled it theoretically with our dynamo code. Since actual polar field measurements exist only from the 1970s, we used the polar faculae number data recorded by Sheeley (1991, 2008) as a proxy of the polar field and estimated the hemispheric asymmetry of the polar field in different solar minima during the major part of the twentieth century. This asymmetry was found to have a reasonable correlation with the asymmetry of the next cycle. We then ran our dynamo code by feeding information about this asymmetry at the successive minima and compared the results with observational data. We found that the theoretically computed asymmetries of different cycles compare favorably with the observational data, with the correlation coefficient being 0.73. We also observed that the hemispheric asymmetry of a cycle either from observational data or from theoretical calculations statistically tends to be less than the asymmetry in the polar field in the preceding minimum. This reduction factor turns out to be 0.43 and 0.51 respectively in observational data and theoretical simulations.

0004 Subsurface Flows Associated with Rotating Sunspots

Kiran Jain, R. Komm, I. Gonzalez Hernandez, S. Tripathy, F. Hill
National Solar Observatory, Tucson, AZ, United States

Rotating sunspots are generally identified and classified by the rotation around their vertical axis. The origin of rotational motion is believed to be the shear and twist in magnetic field lines or vice versa. It has also been suggested that the magnetic twist may result from large-scale flows in the solar convection zone or sub-photospheric layers. In this paper, we present an analysis of active regions consisting of rotating sunspots to infer flow fields below the solar surface. We also compare the variation of the horizontal flow with depth in the rotating sunspots with non-rotating ones. Our preliminary analysis suggests that there is a significant variation in both components of the horizontal flow during the course of sunspot rotation as compared to both the non-rotating sunspot and the quiet Sun. We will also present our recent results on kinetic helicity and vorticity to obtain a detailed picture of flows in sub-photospheric layers.

0005 Dynamic responses of sunspots to their ambient magnetic configuration

Somashekhar Bagare
Indian Institute of Astrophysics, Bangalore, India

In our earlier study titled 'revisit of the Classic Wilson Effect,' it was reported that sunspots respond dynamically, and in an observable manner, to their ambient magnetic configuration. This was based on measurements of a Wilson Effect parameter when the sunspots are closer to the limb than to the disc centre. In the present study, we examine the morphology of a large number of sunspots during their disc passage observed at the Kodaikanal Observatory, together with the magnetic structure of the associated active region. We find that the ratio of the area of penumbra to that of the umbra shows a significant dependence on the magnetic type of the sunspot, implying a directly measurable response of the sunspot morphology to the surrounding magnetic configuration. The result will be discussed in the light of known morphological properties of sunspots.

0006 Numerical Simulations of Mechanism of Sunspot Formation

Irina Kitiashvili[1], Alexander Kosovichev[1], Alan Wray[2], Nagi Mansour[2]
[1]Stanford University, Stanford, CA, United States, [2]NASA Ames Research Center, Moffett field, CA, United States

We use 3D radiative MHD simulations of the upper turbulent convection layer for investigation of physical mechanisms of formation of magnetic structures on the Sun. The simulations include all essential physical processes, and are based of the LES (Large-Eddy Simulations) approach for describing the sub-grid scale turbulence. The simulation domain covers the top layer of the convection zone and the lower atmosphere. The results reveal a process of spontaneous formation of stable magnetic structures from an initially weak vertical magnetic field, uniformly distributed in the simulation domain. The process starts from formation of magnetic filaments at the boundaries of granular cells, which are subsequently merged together into a stable large-scale structure by converging downdrafts below the surface. The resulting structure represents a compact concentration of strong magnetic field, reaching ~6 kG in the interior. It has a cluster-like internal structurization, and is maintained by strong downdrafts extending into the deep layers. We discuss the role of turbulent MHD dynamics in this mechanism, and compare the simulation results with observations of the sunspot formation process during a magnetic flux emergence, from the Solar Dynamics Observatory.

0007 Investigation of Growth and Decay of Sunspots by Time-Distance Helioseismology

Alexander Kosovichev[1], Thomas Duvall, Jr[1]
[1]Stanford University, Stanford, CA, United States, [2]Solar Physics Laboratory, GSFC, NASA, Greenbelt, MD, United States

Local time-distance helioseismology provides important insight into the subsurface structure and dynamics of emerging magnetic flux, formation, evolution and decay of sunspots and active regions. Methods of local helioseismology and acoustic tomography, based on measurements and inversion of acoustic travel times are being intensively developed and tested via numerical simulations. We use helioseismology data from SOHO/MDI to investigate sound-speed structures and mass flows in the solar interior, associated with processes of formations and decay of sunspots, and compare with the dynamics of magnetic fields observed in the solar photosphere. The results reveal significant changes in the subsurface flow patterns during the life cycle of active regions: strong diverging flows during the flux emergence, formation of localized converging flows around stable sunspots, and dominant outflows during the decay. The sound-speed images indicate that
the magnetic flux gets concentrated in strong field structures just below the surface. We describe in detail the evolution of a large emerging sunspot region (AR 10488) and a complex of decaying sunspots (AR 10987-10989). The former was a part of a longitudinal complex of activity, while the later appeared in a narrow latitudinal range. Both of these probably originated from common subsurface nests of activity. We describe our attempt of detecting these nests. The HMI instrument on SDO opens new perspectives for studying the subsurface evolution and magnetic structure of sunspots.

0008 Sunspot behavior during the declining phases of solar cycles 22 and 23

Angie Cookson, Gary Chapman, Dora Preminger
San Fernando Observatory/California State University,Northridge, Northridge, CA, United States

The San Fernando Observatory's on-going photometric program has produced 24 years of images taken at various wavelengths beginning in 1986, a time period that includes the maxima and declining phases of solar cycles 22 and 23. This study compares sunspot behavior during these two cycles as they approach minima in order to determine any significant differences as the Sun continues its extended cycle 23/24 minimum. Sunspot features are determined from full-disk 512x512 pixel images taken with the CFDT1 photometric telescope in the red continuum (672.3nm). Image pixel resolution is 5 arcsec. We look at sunspot frequency, umbral and penumbral areas, umbral-penumbral ratios, and deficit.

0009 Sunspot Temperatures from Red and Blue Photometry

Gary Chapman, Angela Cookson, Dora Preminger
San Fernando Observatory/California State University,Northridge, Northridge, CA, United States

Photometric images are used to measure the temperature of sunspots at different wavelengths. Images at 672.3 nm and 472.3 nm are obtained at the San Fernando Observatory using the CFDT2 (2.5" x 2.5" pixels). Images at 607.1 nm and 409.4 nm are obtained by the PSPT at Mauna Loa Observatory. Monochromatic intensities are converted to temperatures as in Steinegger et al (1990). The pixel-by-pixel temperature for a sunspot is converted into a bolometric contrast for that sunspot according to Chapman et al (1994). Sunspot temperatures, i.e., their bolometric contrasts, are calculated from both red wavelengths (672.3 nm and 607.1 nm) and blue wavelengths (472.3 nm and 409.4 nm) and

compared.

This research was partially supported by NSF Grant ATM-0848518.

0010 Hydrogen Winds Drive Sunspot Penumbrae Formation

Jeff Kuhn
Institute for Astronomy, University of Hawaii, Pukalani, Maui, HI, United States

Molecular hydrogen in the coolest part of young sunspot umbrae can diffuse across magnetic field lines. Simple calculations suggest that this wind is an important dynamical force in driving the outward Evershed flow. Such a diffusive seems unavoidable and is likely to play an important role in the formation and evolution of penumbrae.

0011 3D simulations of interaction of solar oscillation modes with sunspots

Vyacheslav Olshevsky[1], Konstantin Parchevsky[3], Elena Khomenko[4], Alexander Kosovichev[3], Manuel Collados[4]
[1]Center for Turbulence Research, Stanford University, Stanford, United States, [2]Main Astronomical Observatory of National Academy of Sciences, Kyiv, Ukraine, [3]Hansen Experimental Physics Laboratory, Stanford University, Stanford, United States, [4]Instituto de Astrofisica de Canarias, La Laguna (Tenerife), Spain

Modeling of interaction of solar oscillations with sunspots is very important for interpretation and analysis of helioseismology data, and understanding of the subsurface magnetic and thermal structure of sunspots. We present results of three-dimensional MHD numerical simulations of a single wave packet traveling through magnetostatic sunspot models. The simulations were carried out using two independent MHD codes, specially developed for modeling of helioseismic waves. The frequency spectrum of an initial wave packet generated by a localized impulsive wave source reproduced the observed spectrum of solar oscillations. For the analysis, we apply a ridge-filtering technique and study the interaction of individual oscillation modes with the sunspot region. The simulations have been performed for a set of different sunspot models and source locations. These results are compared with simulations of the same wave packet propagating in a uniform, non-magnetized model. We analyze variations of the wavefront shape and oscillations amplitude caused by interaction with sunspot. We calculate travel time shifts in the sunspot models by cross-correlating the vertical velocity signals of the quiet Sun and sunspot models. We compare our simulations with the results, obtained recently by local helioseismology techniques, and discuss improvements needed for the sunspot models.

2. Solar Magnetism

0012 Higher order corrections to dust ion-acoustic solitons in a quantum dusty plasma

Prasanta Chatterjee
Visva Bharati University, Santiniketan, Indonesia

Dust ion-acoustic solitons are studied in a an electron-dust-ion plasma by employing the two fluid quantum hydrodynamic (QHD) model. Ions and electrons are assumed to follow quantum mechanical behavior in dust background. The Korteweg de Vries (KdV) equation and higher order contribution to KdV equations are derived using Reductive perturbation technique(RPT). The higher order contribution is obtained as a higher order inhomogeneous differential equation. To obtain the nonsecular solution of the higher order contribution the renormalization method is used and to get the particular solution of the non homogeneous equation a truncated series solution method is used.

0013 Interplanetary Magnetic Field and solar rotation

Hari Vats
Physical Research Laboratory, Ahmedabad, India

The Sun's magnetic field isn't confined to its immediate vicinity. The solar wind carries it throughout the solar system up to the heliopause. The Sun's magnetic field out among the planets is called the Interplanetary Magnetic Field (IMF). As the Sun rotates; the IMF has a spiral shape -- named the "Parker spiral" after the scientist who first described it. The interplanetary magnetic field is measured in three components by the Advanced Composition Explore (ACE). ACE orbits the L1 libration point which is a point of Earth-Sun gravitational equilibrium about 1.5 million km from Earth. From this ACE has a prime view of the solar wind, interplanetary magnetic field. The purpose of this work is to determine how the interplanetary magnetic field is affected by the solar rotation. For this data of ACE over a long period of time is processed using autocorrelation and spectrum analysis. It is found that Bx and By component of IMF have a very strong modulation of solar rotation and cane be easily used to very precisely determine the solar rotation. On the other hand on Bz this modulation is completely absent. The estimated sidereal rotation periods for the years 2000 and 2001 are 25.75 and 23.85 days respectively. Thus rotation in 2001 is faster than that in 2000. This is in contrast with the earlier measurements using other features on the solar surface. Here an exhaustive attempt will be made to compare and discuss the rotation measurements obtained by various techniques.

0014 Filaments supported by different magnetic field configurations

Yang Guo[1], Brigitte Schmieder[2], Pascal Démoulin[1], T. Wiegelmann[3], Guillaume Aulanier[1], Tibor Török[1], Véronique Bommier[1]
[1]Nanjing University, Nanjing, China, [2]Observatoire de Paris, Meudon, France, [3]Max Planck Institut, Lindau, France

A nonlinear force-free magnetic field extrapolation of vectormagnetogram data obtained by THEMIS/MTR on May 27 2005

suggeststhe simultaneous existence of different magnetic configurationswithin one active region filament: one part of the filament issupported by field line dips within a flux rope, while the otherpart is located in dips within an arcade structure. Although theaxial field chirality (dextral) and the magnetic helicity (negative)are the same along the whole filament, the chirality of the filament barbsis opposite, i.e., right-bearing in the flux rope part and left-bearing in the arcade part. This argues against past suggestionsthat different barb chiralities imply different signs of helicityof the underlying magnetic field. This new finding about the chirality of filaments will be useful to associate eruptive filaments and magnetic cloud using the helicity parameter in the Space Weather Science.

0015 Evidence for convection in Sunspot penumbra

Lokesh Bharti, Sami K. Solanki, Johann Hirzberger
Max-Planck Institute for solar System Research, Katlenburg, Lindau, Germany

Recently discovered twisting motions in penumbral filaments are assumed to be the upflowing domains of overturning convection viewed from an inclined vantage point. We are interested in finding out if these motions are in any way related to heat transport from below. We present an analysis of twisting motions in penumbral filaments in sunspots located at heliocentric angles from 30-48 degrees using three time series of blue continuum images obtained by the Broadband Filter Imager (BFI) onboard *Hinode*. The relations of the twisting motions to the filament brightness and the position within the filament and within the penumbra, respectively, are investigated. Only certain portions of the filaments show twisting motions. In a statistical sense, the inner point of the twisting portions of the filaments are brightest and possesses fastest twisting motions with mean horizontal velocity of 2.1 kms^{-1}. The middle and outer points of the twisting portion of the filaments, which are less bright, have mean velocities of 1.7 kms^{-1} and 1.35 kms^{-1}, respectively. The observed reduction of brightness and twisting motion velocity towards the outer points of the filaments may be due to reducing upflow along the filament's long axis. The obtained correlation of brightness and velocity is what is expected if overturning convection causes the twisting motions, since larger flow velocities imply transport of a larger energy flux. This supports the idea that convective motions in the presence of a magnetic field are the source of the energy needed to maintain the brightness of the filaments.

0016 Are the Photospheric Sunspots Magnetically Force-Free in Nature?

Sanjiv Kumar Tiwari
Udaipur Solar Observatory, Physical Research Laboratory, Dewali, Bari Road, Udaipur, Rajasthan, India

A magnetic field is force-free if there is no interaction between the magnetic field and the plasma in the surrounding atmosphere i.e., electric currents are aligned with the magnetic field, giving rise to zero Lorentz force. The computation of many magnetic parameters like magnetic energy (using virial theorem), gradient of twist of sunspot magnetic fields (computed from the force-free parameter alpha), including any kind of extrapolations heavily hinge on the force-free approximation of the photospheric magnetic fields. The force-free magnetic behaviour of the photospheric sunspot fields has been examined by Metcalf et al., (1995) and Moon et al., (2002) ending with inconsistent results. Metcalf et al., (1995) concluded that the photospheric magnetic fields are far from the force-free nature whereas Moon et al., (2002) found that the photospheric magnetic fields are not so far from the force-free nature as conventionally regarded. The accurate photospheric vector field measurements with high resolution are needed to examine the force-free nature of sunspots. We use high resolution vector magnetograms obtained from the Solar Optical Telescope/Spectro-Polarimeter (SOT/SP) aboard Hinode to inspect the force-free behaviour of the photospheric sunspot magnetic fields. The effect of polarimetric noise on measuring the force-free ness of sunspot fields have also been investigated.

0017 A theoretical model of torsionaloscillations from a flux transport dynamo model

Piyali Chatterjee[1], Sagar Chakraborty[2], Arnab Rai Choudhuri[3]
[1]NORDITA, Stockholm, Sweden, [2]Niels Bohr Institute, Copenhagen, Denmark, [3]Indian Institute of Science, Bangalore, India

Torsional oscillations, which appear as fast and slow rotating bands on the solar surface, provide observational evidence for the back reaction of the magnetic cycle on the solar flows. However, the faster rotating band is observed at the solar surface 2-3 years before the first sunspots of the upcoming cycle appear on the solar surface. We conjecture that this apparent violation of causality can be resolved if the Lorentz stress is initiated at the high latitude tachocline due to production of strong toroidal fields there and are propagated upwards due to Alfven waves. We present below results from a mean field model coupled with an equation for the azimuthal velocity to support our claim. The reader is also requested to look at Chakraborty, Choudhuri and Chatterjee (2009, PRL, 102, 041102 and PRL, 103, .099902), where this work was originally published.

0018 Real-time estimation of Sun-Earth magnetic connection for predicting well-connected SEP events and identifying the associated solar region.

Marlon Nunez
Universidad de Malaga, Malaga, Spain

Energetic solar particles follow spiral paths all the way. If the Parker spiral were stable, the heliolongitude of the origin of the magnetic connection from the flaring region to the observer would be the same in well-connected SEP events, however interplanetary magnetic field lines are not stable and there are solar phenomena that can affect them. The magnetic connection may be detected by searching a cause-effect pattern between X-ray fluxes, corresponding to the solar activity, and the proton flux, corresponding to the consequences detected near Earth. We may estimate the correlation between these fluxes and empirically deduce the magnetic connection. This approach may also identify the flare associated to the proton enhancement. Another intermediate output of this approach

is the lag between cause and effect, that is to say, the traversal time of protons from the Sun to the Earth. The well-connected SEP forecaster, which is a part of a forecaster with a broader scope, may also predict the intensity of the first hours of the expected proton event.

0019 Transmission and reflexion of p mode in sunspots

Khaled Khelfi, Toufik Abdelatif
CRAAG, Algiers, Algeria

The p-modes are oscillations observed at the sun surface, witch permit to probe its interior structure. These modes interact with the superficial layers of the sun. The convection zone of the sun is the source of all disturbances and thus of the oscillating wave energy .This later is transmitted through the upper layers of the sun atmosphere up to the solar corona. It is, therefore, imperative to study the p-modes propagation through these layers, knowing that in magnetized medium, these modes are confined under sun surface. In this work, we explore interaction of acoustic waves with a simple structure composed of two regions: i) non-magnetic region, ii) magnetic region with flow. The reflected and transmitted waves and the energy balance are studied and examinated, in the aim of determining the negative energy and the unstable modes.

0020 Microwave Depolarization and Coronal Magnetic Polarity above Sunspots

Jeongwoo Lee
New Jersey Institute of Technology, Newark, NJ, United States

Microwave emissions from sunspots are circularly polarized in the sense of rotation (right or left) determined by the polarity of coronal magnetic fields. However, they may convert into un-polarized emissions under certain conditions of magnetic field and electron density in the corona, and this phenomenon of depolarization could be used to derive those parameters. We propose another diagnostic use of microwave depolarization based on the fact that an observed depolarization strip actually represents the coronal magnetic polarity inversion line (PIL) at the heights of effective mode coupling, and its location itself carries information on the distribution of magnetic polarity in the corona. To demonstrate this diagnostic utility we generate a set of nonlinear force-free field models for a complex active region with the observed line-of-sight magnetic fields but varying current density distribution and compare them with multi-frequency microwave polarization maps obtained with the Very Large Array (VLA). The field extrapolation predicts very different locations of the depolarization strip in the corona depending on the amount of electric currents assumed in the photosphere. Such high sensitivity of microwave depolarization to the coronal magnetic polarity is useful for validating electric current density maps inferred from vector magnetic fields observed in the photosphere.

0021 Vector magnetic field and vector current density in and around the delta-spot AR 10808 observed with THEMIS

Véronique Bommier
Observatoire de Paris, Meudon, France

The spectropolarimetric data were acquired with THEMIS in the two lines Fe I 6301.5 and 6302.5 on 13 September 2005. The magnetic field vector was inferred by using Milne-Eddington inversion (UNNOFIT), for the normal Zeeman triplet line 6302.5 but also adapted to the non-normal Zeeman triplet line 6301.5 (UNNOFIT2). By adding a line formation depth difference modeling, the field divergence was accessible and was used to solve the field ambiguity by minimisation. Then, the vector current density was inferred, that shows strong horizontal currents in the penumbra, perpendicular to the field vector.

0022 Substructure of the quiet sun bright points

Aleksandra Andic[1], Jongchul Chae[2], Phillip R. Goode[1]
[1]Big Bear Solar Observatory, Big Bear City, CA, United States, [2]Seoul National University, Seoul, Korea, Republic of

Since photospheric bright points (BPs) were discovered, there has been a basic question about their structure. Are they just single flux tubes or bundles of smaller fibers? Using the 1.6 meter New Solar Telescope (NST)
at Big Bear Solar Observatory, we observed a rich, finer spectrum of BPs in the quiet Sun, and may have resolved individual components in some of the BP's clusters and ribbons. The average size of the observed BPs was 0''.22, and the size of the smallest BPs was 0".15. Since the resolution of our NST observations was close to the diffraction-limited resolution of 0".1 at the observation wavelength of 700 nm, the observations hint that each resolved BP may correspond to a monolithic magnetic flux tube without any substructure. Pending observations with the NST will give better insight to
the veracity of the hint.

0023 Are the umbral dots, penumbral grains, and G band bright points formed by the same type of magnetic flux tubes?

Isroil Sattarov
Tashkent State Pedagogical University, Tashkent, Uzbekistan

Today's Solar Physics comes across problem different types of fine structures in solar atmosphere. Examples of small scale features include It was found fine features named as umbral dots and penumbral grains in sunspots, and photospherices G-band bright points observed in quiet Sun. G-band images of solar surface. Our previous investigation of We studied evolution of penumbral grains and umbral dots of rotating sunspot and magnetic field of umbral dots [1] has revealed a . We found transformation of penumbral grains to umbral dots and vice versa. And in our We study of magnetic field of umbral dots, we have and found evidence that the dots are associated with magnetic flux tubes oriented perpendicular to solar surface [2]. Similarly, It seems the G band bright points may be are the associated with magnetic flux tubes located in the intergranular space.

In this report we present an evideance to support that which shows the umbral dots, and penumbral grains, and, possibly, G band bright points are related to the same type of features - magnetic flux tubes in solar atmosphere.

1) Sattarov, I., The Fine Structure of Sunspots from the Groundbased Small Telescope, 2003, ASPC, 286, 307;
2) Sattarov, I., Zeeman Splitting of Spectral Lines in Different Structural Elements of Sunspot Umbrae, 1980, SvA, 24, 252;

0024 Evolution of Magnetic Shear in Emerging Flux Regions

Sanjay Gosain
Udaipur Solar Observatory, Physical Research Laboratory, Udaipur 313001, India

We study the evolution of magnetic shear angle in a set of Active Regions (ARs) in flux-emergence stage. We call these regions Emerging FLux Regions (EFRs). To this end, we use a sequence of de-projected high-angular resolution vector magnetograms obtained by Hinode SOT/SP instrument. The shear angle distribution in an active region depends upon the non-potentiality of the active region. It is believed that the non-potentiality in an AR tends to be large during flux emergence phase and reduces as the AR slowly decays. We study (i) the distribution of magnetic shear in an EFR to detect the correlation between the locations of flux emergence and magnetic shear, and (ii) the correlation between the rate of flux emergence and rate of change of mean shear angle of the active region.

0025 Local helioseismic and spectroscopic analyses of interactions between acoustic waves and a sunspot

S.P. Rajaguru[1], Richard Wachter[2], K. Sankarasubramanian[3], Sebastien Couvidat[2]
[1]Indian Institute of Astrophysics, Bangalore, India, [2]Stanford University, Stanford, CA, United States, [3]Indian Space Research Organization - Satellite Centre, Bangalore, India

Using a high cadence imaging spectropolarimetric observation of a sunspot and its surroundings in magnetically sensitive (Fe **I** 6173 A) and insensitive (Fe **I** 7090 A) upper photospheric lines, we map the instantaneous wave phases and helioseismic travel times as a function of height (within the formation layers of the chosen lines) as well as of line of sight inclination of magnetic field. We confirm the magnetic inclination angle dependent transformation of quiet-Sun originating acoustic waves into propagating waves up through the sunspot atmosphere. We derive, (1) proof that the helioseismically measured travel times recieve direction dependent contributions from such propagating waves and hence cause errors in conventional flow inferences, (2) evidences for acoustic wave sources beneath the umbral photosphere, and (3) significant differences in travel times measured from the chosen magnetically sensitive and insensitive spectral lines. We discuss the possible origin of acoustic sources in field free convection beneath the umbra of the spot and its implications for sub-surface structure of sunspots.

0026 Axisymmetric absorption of p-modes by solar magnetic plage

Andrew Gascoyne, Rekha Jain
University of Sheffield, Sheffield, United Kingdom

The buffeting action of the solar acoustic waves (p-modes) with magnetic fibril fields excites MHD tube waves. We model these fibril fields as axisymmetric, vertically oriented, thin, magnetic flux tubes. The MHD tube waves propagating along the length of the tube thus carry energy away from the p-mode cavity creating an energy deficit in the outgoing p-modes. We calculate absorption coefficient due to this energy deficit. We then study the absorption of p modes due to a simulated plage region by modelling the plage as a forest of many magnetic flux tubes. We will present a calculation of absorption coefficient for this model plage with a random distribution of thin flux tubes of varying plasma properties.

0027 Solar activity studies from Kodaikanal Ca-K data

Raju Kuttickat
Indian Institute of Astrophysics, Bangalore, India

The Ca-K images of the Sun from Kodaikanal have a data span of about 100 years. This covers over 9 solar cycles and hence a good opportunity to study the synoptic solar activity. The Ca-K images are dominated by the chromospheric network and plages which are good indicators of activity. Further, the Ca-K line is a good proxy to the UV irradiance which is particularly useful in the pre-satellite era. The archival data is now available in the digitized form. Programs have been developed for data reduction and analysis. In this preliminary study, network and plage indices which represent the fractional area of the features over the solar disk are obtained. The behavior of these indices with respect to the sunspot number will be presented.

0028 How reliable are observations of solar magnetic fields? Comparison of full-disk measurements in different spectral lines and calibration issues of space missions SOHO, Hinode, and SDO

Mikhail Demidov
Institute of Solar-Terrestrial Physics, Irkutsk, Russian Federation

An urgent modern solar physics problem, which is not perfectly solved up to now, is obtaining of realistic magnetic field strength values from parameters measured by magnetographs or Stokes-meter instruments. One of the important tools on this way is a comparison of observations made in different spectral lines on the same or on the different telescopes. This issue, together with others applications, is an actual task in analysis of the new data sets provided by space missions: SOHO and Hinode, which measurements are available for several years already, and SDO, which data are expected in a nearest future. The main aim of this study is a cross-comparison of magnetic field observations made in different spectral lines used on the above mentioned space observatories: Ni I 676.77 nm (SOHO/MDI), FeI 630.15 nm and FeI 63.025 nm (Hinode/SP), FeI 617.33 nm (SDO/HMI). Full-disk high-precision Stokes-meter measurements on the STOP telescope at Sayan observatory are used basically, as well as some data from SOHO and Hinode. Besides, observations in other spectral lines having a great diagnostics impact,

such as FeI 525.02 nm, FeI 523. 29 nm and FeI 532.4 2 nm are analyzed. The difference between one-instrument (STOP) simultaneous or quasi-simultaneous observations in different spectral lines do not exceeds factor by 2-3 depending on combination of spectral lines and position on solar disk. This is significantly less then in some other studies devoted to cross-comparison of different data sets. Importance and consequences of the obtained results are discussed.

0029 Towards Physics-based Helioseismic Inversions of Subsurface Sunspot Structure

Douglas Braun[1], Aaron Birch[1], Ashley Crouch[1], Matthias Rempel[2]
[1]NWRA/CoRA, Boulder, CO, United States, [2]NCAR/HAO, Boulder, CO, United States

Current controversy exists in the interpretation and modeling of helioseismic measurements of sunspots. A major issue is the discrepancy between the relatively deep two-layer wave-speed models derived from standard time-distance helioseismic inversions and shallow, positive wave-speed perturbations inferred from forward models which include effects of mode conversion. To make full use of the year-round, almost limb-to-limb, coverage provided by HMI onboard the Solar Dynamics Observatory, an efficient and reliable inversion method incorporating magnetic effects is critical. Key components of an effort to understand and resolve these issues include numerical computations of wave propagation through model sunspots, including realistic MHD models developed at NCAR, as well as translationally invariant models developed at NWRA.

This work is supported by the NASA SDO Science Center and Heliophysics GI programs through contracts NNH09CE41C and NNG07EI51C.

0030 Helioseismic probing of the subsurface structure of sunspots

Ashley Crouch, Aaron Birch, Douglas Braun, Christopher Clack
NWRA/CoRA, CO, United States

We will discuss recent progress in the helioseismic probing of the subsurface structure of magnetic regions. To simulate the interaction of helioseismic waves with magnetic fields and thermal perturbations we use a simple model for the interaction that is translation-invariant in the horizontal directions, has a realistic stratification in the vertical direction, and has physically consistent boundary conditions for the waves at the upper and lower boundaries of the computational domain. Using this model we generate synthetic helioseismic data and subsequently measure time-distance travel times. We will show the sensitivity of these travel times to magnetic fields and changes in subsurface structure. We will show the effect of magnetic fields on inversions for wave speed. We will discuss how these results relate to the local helioseismology of sunspots. This work is supported by NASA contracts NNH09CE41C and NNG07EI51C.

0031 Properties of magnetic bipoles and the solar cycle

Andrey Tlatov[1], Valerya Vasil'eva[1], Alexei Pevtsov[2]
[1]Kislovodsk Solar Station, Kislovodsk, Russian Federation, [2]National Solar Observatory, Sunspot, NM, United States

We employ synoptic full disk longitudinal magnetograms to study latitudinal distribution and orientation (tilt) of magnetic bipoles in the course of sunspot activity during Cycles 21, 22, and 23. The data set includes daily observations from the NSO-Kitt Peak (1975-2002) and SOHO/MDI (1996-2009). Bipole pairs were selected on the basis of proximity and flux balance of two neighboring flux elements of opposite polarity. Using total area of bipole, we have separated them on small quiet Sun bipoles (QSBs), ephemeral regions (ERs), and active regions (ARs). We find that in their orientation, ERs and ARs follow the Hale-Nicholson polarity rule. As expected, AR tilts follow the Joy's law. ERs, however, show significantly larger tilts of opposite sign for a given hemisphere. QSBs are randomly oriented. Unlike ARs, ephemeral regions also show a preference in their orientation depending on polarity of large-scale magnetic field. These orientation properties may indicate that some ERs may form at/near the photosphere via the random encounter of opposite polarity elements.

Combined latitudinal distribution of ERs and ARs exhibits clear presence of Spörer's butterfly diagram. ERs extend ARs' "wing" of butterfly diagram to higher latitudes. This high latitude extension of ERs suggests an extended solar cycle with the first magnetic elements of the next cycle developing shortly after the maximum of previous cycle. Polarity orientation and tilt of ERs may suggest the presence of poloidal fields of two configurations (new cycle and old cycle) in the convection zone at the declining phase of sunspot cycle.

0032 Temporal Changes in the Frequencies, Widths, Amplitudes, and Asymmetries of the Solar p-Mode Oscillations During Solar Cycle 23

Edward Rhodes[1], Johann Reiter[2], Jared Brooks[1], Patrick McFaddin[1], Brittney Miller[1], Jorge Rodriguez[1], Jin Yoo[1]
[1]University of Southern California, Los Angeles, CA, United States, [2]Technical University of Munich, Munich, Germany

We will present the results of a study of the temporal changes in the frequencies, widths, amplitudes, and asymmetries pf the solar p-mode oscillations as functions of the changing levels of overall solar activity during Solar Cycle 23. In particular, we divided up the Annual MDI Full-Disk Program Dynamics Runs from 1996 through 2001 and from 2006 through 2008 into a total of 213 three-day time series and we computedsets of m-averaged power spectra from each of these time series. We then fit sll of these power spectra and we inter-compared the differences in the modal parameters that we obtained from these different time series as functions of the differences in up to ten different activity indicators. We have also carried out the same analyses on a set of 28 different 3-day time series of GONG++ observations obtained during 2001. We have computed the sensitivities of the different p-mode parameters to the activity differences for a total of 25 different frequencies and we have found a new signature in the frequency dependence of the frequency shifts of the modes. We have also

discovered a similar but slightly different signature of the temporal changes in the widths of the modes. We have also found different signatures for the temporal changes of the modal asymmetries and amplitudes. We have also found that these signatures change systematically with the changing level of activity. We believe these results should provide better constraints on the mechanisms which are causing the changes in the modal parameters.

0033 Identifying the dominant form of heating in active region using Hinode/EIS observations

Durgesh Tripathi
University of Cambridge, Cambridge, United Kingdom

The identification of the dominant heating mechanism in solar active regions requires a precise measurement of physical plasma parameters and their variation with time in all kind of coronal loops. Using the spectra obtained by the Extreme-Ultraviolet Imaging Spectrometer aboard Hinode, we have studied electron density, temperature, emission measure distribution, filling factor and plasma flow in both warm (T = 1MK) loops (seen at the periphery of active regions) as well as moss regions - which are essentially the footpoints of the hot loops (T = 2-4MK) - seen in the core of the active regions. Our measurements suggest that heating and emission in both warm and hot loops could be explained by dominance of impulsive heating mechanism.

0034 Correlations of magnetic features and the torsional pattern

Judit Muraközy, András Ludmány
Heliophysical Observatory, Debrecen, Hungary

The striking similarity between the cyclic equatorward migration of the torsional oscillation belts and the sunspot activity latitudes inspired several attempts to seek an explanation of the torsional phenomenon in terms of interactions between flux ropes and plasma motions. The aim of the present work is to examine the spatial and temporal coincidences of the torsional waves and the emergence of sunspot magnetic fields. The locations of the shearing latitudes have been compared with the distributions of certain sunspot parameters by using sunspot data of more than two cycles. The bulges of the sunspot number and area distributions tend to be located within the 'forward' belts close to their poleward shearing borders. A possible geometry of the magnetic and velocity field interaction is proposed.

0035 Spectropolarimetric observations of the evolution of sea-serpent penumbral filaments

Alberto Sainz Dalda[1], Luis Bellot Rubio[1]
[1]Stanford-Lockheed Institute for Space Research, Palo Alto, CA, United States, [2]Instituto de Astrofísica de Andalucía, Granada, Andalucía, Spain

The sea-serpent-like behavior of penumbral filaments is an important constraint for understanding the penumbra and for those models and numerical simulations that try to explain it. The sea-serpent filaments become moving magnetic features in the sunspot moat. In addition, they are the best candidates to explain both the Evershed flow and Evershed clouds. To understand the dynamics of these filaments and relate them to other penumbral features it is necessary to investigate their evolution with full Stokes polarimetry. In this study we use high spatial and temporal resolution spectropolarimetric data obtained by the Hinode/SP instrument and inversion of the Stokes profiles to infer the physical properties of the opposite-polarity patches that form the sea-serpent penumbral filaments.

0036 Signature of Collision of Magnetic Flux Tubes in the Quiet Solar Photosphere

Aleksandra Andic
Big Bear Solar Observatory, Big Bear City, CA, United States

Collision of the magnetic flux tubes in the Quiet Sun was proposed as one of the possible sources for the heating of the solar atmosphere (Furusawa and Sakai, 2000). The solar photosphere was observed using the New Solar Telescope at Big Bear Solar Observatory. In TiO spectral line at 705.68 nm we approached resolution of 0''.1. The horizontal plasma wave was observed spreading from the larger bright point. Shortly after this wave, an increase in the oscillatory power co-spatial with the same bright point was noted. This behaviour matches some of the results from the simulation of the collision of the two flux tubes with a weak current.

Furusawa, K. and Sakai J., 2000, ApJ, 540, 1156

0037 Photospheric data programs at the Debrecen Observatory

Lajos Györi, Tünde Baranyi, András Ludmány
Heliophysical Observatory, Debrecen, Hungary

The primary task of the Debrecen Observatory is the most detailed, reliable and precise documentation of the solar photospheric activity. This long-term effort started with the continuation of the Greenwich photoheliograph program, this is the Debrecen Photoheliographic Data (DPD) sunspot catalogue based on ground based observations. The profile of the work has later been extended to space-born observations (SOHO/MDI and SDO), to magnetic fields and faculae as well as to higher temporal resolution (one hour) and nearly real time data supply. In the future the extension will also include historical observations. If later supports allow, the ultimate aim will be the sunspot data supply for each day when full disc images were recorded at all. The web-presentation of the material is easy to search and browse.

0038 Chromosphere above sunspots as seen at millimeter wavelengths

Maria Loukithcheva[1], Sami Solanki[2], Stephen White[3]
[1]Astronomical Institute, St.Petersburg University, St.Petersburg, Russian Federation, [2]Max-Planck-Institute for Solar System Research, Katlenburg-Lindau, Germany, [3]Astronomy Department, University of Maryland, College Park, MD 20742, United States

Millimeter emission is known to be a sensitive diagnostics of temperature and density in the solar chromosphere. In this work we use millimeter waves to distinguish between various atmospheric models of sunspots, whose temperature structure in the upper photosphere and chromosphere has been some source of controversy. From mm brightness simulations we expect a radio umbra to change its appearance from dark to bright (compared to the Quiet Sun) at a given wavelength in the millimeter spectrum (depending on the exact temperature in the model used). Thereby millimeter brightness observed above umbra at several wavelengths imposes strong constraints on temperature and density stratifications of the sunspot atmosphere, in particular on the location and depth of the temperature minimum and the location of the transition region. Current mm/submm observational data suggest that brightness observed at short millimeters is unexpectedly low as compared to the most widely used sunspot models such as of Maltby et al. (1986). A successful model that is in agreement with millimeter umbral brightness should have an extended and deep temperature minimum (below 3000 K) as those in the models of Caccin et al. (1993) and Severino et al. (1994). However, we are not able to resolve the umbra cleanly with the presently available observations and better resolution as well as better wavelength coverage are needed for accurate diagnostic of umbral brightness at millimeter wavelengths. This adds one more scientific objective for the oncoming Atacama Large Millimeter/Submillimeter Array (ALMA).

0039 Study of Sunspot Motion and Flow Fields Associated with Solar Flares

Shuo Wang, Chang Liu, Haimin Wang
New Jersey Institute of Technology, Newark, NJ, United States

Evolution of sunspot structure and photospheric magnetic fields are important to understand how the flare energy is built up and released. With high-resolution optical data, it is possible to examine in details the optical flows of the photosphere and their relationship to the flaring process. Using G-band and Stokes-V data obtained with Hinode Solar Optical Telescope, we study the sunspot motion and flow fields associated with the 2006 December 13 X3.4 flare in NOAA AR 10930. We calculate the centroids of the delta spot umbrae lying in opposite magnetic polarities, and use various local correlation tracking techniques to derive the photospheric flow fields of the AR. We find that the shearing motion before the flare changes to unshearing motion associated with the eruption. A decrease of average velocity of shear flow is found to be associated with the flare, with a magnitude of 0.2 km/s.

As a related study, we also test implementing the recently developed differential affine velocity estimator for vector magnetograms (DAVE4VM; Schuck 2008) technique for the magnetic field observations obtained by the Big Bear Solar Observatory (BBSO) and Helioseismic Magnetic Imager (HMI) on board the Solar Dynamic Observatory. Using this method to analyze changes of active region magnetic fields associated with flares may shed new light on the cause and effect of flaring process.

0040 Evolution of Magnetic Setting in Flare Productive Active Regions

Yixuan Li[1], Ju Jing[1], Yuhong Fan[2], Haimin Wang[1]
[1]NJIT, Newark,NJ, United States, [2]HAO/NCAR, BOULDER,CO, United States

Recent observations demonstrated the rapid penumbra decay in the outer part of sunspot and the enhancement of inner part after major flares. In an effort to understand the physics behind the phenomena, we study the changes of magnetic inclination angle at the peripheral and the inner penumbral regions around flaring time. For all the events, we find that the mean inclination angle at the penumbral decay regions increases after the flares. Furthermore, we quantitatively compare our observations with recent MHD simulations of eruption, by Yuhong Fan which shows the evidence of field lines turn to more horizontal near the surface, immediately following the eruption. The result suggests that outer penumbral fields change from a more inclined to a more vertical configuration after the flare, while the fields at flaring neutral line become more horizontal.

0041 Comparison of numerical simulations and observations of helioseismic MHD waves in sunspots

Konstantin Parchevsky, Junwei Zhao, Kaori Nagashima, Alexander Kosovichev
Stanford University, Stanford, CA, United States

Numerical 3D simulations of MHD waves in magnetized regions with background flows are very important for understanding of propagation and transformation of waves in sunspots. Such simulations provide artificial data for testing and calibration of helioseismic techniques used for analysis of data from space missions SOHO/MDI, SDO/HMI, and HINODE. We compare with helioseismic observations results of numerical simulations of MHD waves in different models of sunspots. The simulations of waves excited by a localized source provide a detailed picture of the interaction of the MHD waves with the magnetic field and background flows (deformation of the waveform, wave transformation, amplitude variations and anisotropy). The comparison of the observed cross-covariance function (effective Green's function of helioseismic waves) with simulations shows that for some ("deep") sunspot models the waves inside the sunspot have smaller amplitude than the waves propagating in the quiet regions, which is in agreement with the observations. But in some other ("shallow") sunspot models the wave amplitude is higher inside the sunspot than in the quiet Sun. Thus, such shallow sunspot models are not consistent with the helioseismic data. Both simulations and observations show that the wavefront inside the sunspot goes ahead of a reference "quiet-Sun" wavefront when the wave enters the sunspot. However, when the wave passes the sunspot, the time lag between wavefronts becomes unnoticeable. We also present the simulation results of stochastic oscillations excited by multiple random

sources, which provide artificial data for testing local helioseismology and calibration of helioseismic inferences of the subsurface structure of sunspots.

3. Origins of Solar Activity

0042 Two types of Coronal Bright Points: their characteristics and evolution

Isroil Sattarov[1], Alexsei Pevtsov[2], Nina Karachik[2], Chori Sherdanov[3], Azlarxon Tillaboev[1]

[1]Tashkent State Pedagogical University, Tashkent, Uzbekistan, [2]National Solar Observatory, Sunspot, NM, United States, [3]Astronomical Institute of AS of Uzbekistan, Tashkent, Uzbekistan

Coronal bright points (CBPs) are compact (point-like) coronal brightenings first observed in X-ray and later in UV and EUV wavelenths. The existence of two types of CBPs (i.e., CBPs associated with the quiet Sun and CBPs found around the active regions) was suggested by Golub, Krieger, and Vaiana (1975, Solar Phys. 42, 131); later studies had confirmed this early suggestion (e.g. Sattarov et al. 2002, Astrophys.J. 564, 1042; McIntosh and Gurman 2005, Solar Phys. 228, 285). Using the maximum brightness of CBPs as a criterion, Sattarov et al. (Solar Phys. 2010, DOI 10.1007/s11207-010-9524-5) have separated CBPs on two categories: dim CBPs, associated with areas of a quiet Sun and bright CBPs, associated with an active Sun. The questions we ask in this study are: what is the difference between the two types of CBPs, how do they develop and evolve, and what are the mechanisms of flaring in these two types of bright points. We investigate the characteristics of the two types of CBP and their evolution, including the latitudinal distribution, temporal variation of CBP's maximal intensity, area and axis tilt and the lifetime.

0043 A possible explanation of the Maunder minimum from a flux transport dynamo model

Bidya Binay Karak, Arnab Rai Choudhuri

Department of Physics, Indian Institute of Science, Bangalore-560012, India

We propose that the poloidal field at the end of the last sunspot cycle before the Maunder minimum fell to a very low value due to fluctuations in the Babcock--Leighton process and also due to the stochastic fluctuations of meridional circulation. With this assumption, a flux transport dynamo model is able to explain various important features of the historical records of the Maunder minimum (e.g., sudden initiation but gradual recovery, periodic but weaker oscillation and North-South asymmetry observed during the last phase of Maunder minimum) remarkably well on choosing the parameters of the model suitably to give the correct growth time.

0044 Relationship between Solar Flares and CMEs

Rajmal Jain

Physical Research Laboratory, Ahmedabad, Gujarat, India

The relationship between solar flares and Coronal Mass Ejections (CMEs) is a big issue in solar physics. Both the phenomena often occur in conjunction but the relationship is not one to one and the exact nature of the flare and CME triggers between the cause and consequence is still open and quite puzzling. We briefly review the current international scenario. We present recent investigation using "Solar X-ray Spectrometer (SOXS)" onboard GSAT-2 Indian spacecraft and LASCO/SOHO mission data on the relationship between the velocity of CMEs and the plasma temperature of the associated X-ray solar flares. The SOXS mission will be briefly overviewed. Our results are major breakthrough in advancing the current understanding of these two phenomena. The velocity of CMEs increases with plasma temperature (R = 0.82) and photon index below the break energy (R = 0.60) of X-ray flares. The heating of the coronal plasma appears to be significant with respect to the kinetics of a CME from the reconnection region where the flare also occurs. It is proposed that the initiation and velocity of CMEs perhaps depend upon the dominant process of conversion of the magnetic field energy of the active region to heating/accelerating the coronal plasma in the reconnected loops. Our results show that a flare and the associated CME are two components of one energy release system, perhaps, magnetic field free energy.

0045 Energy-dependent X-ray Emission from Solar Flares

Arun Awasthi, Rajmal Jain

Physical Research Laboratory, Ahmedabad, Gujarat, India

We investigate energy-dependent X-ray emission process in 12 M-class solar flares observed by Si and CZT detectors of SOXS experiment launched in 2003. The spectral resolution provided by Si and CZT detectors is ~0.7and ~1.7 keV in their dynamic energy range of 4-25 and 4-56 keV respectively. To understand the chromospheric evaporation (CE), we estimate the fraction Qf (thermal to the total X-ray emission) as the ratio of SXR flux in 4-25 keV energy band to time-integrated HXR flux in 25-50 keV energy band de-convolved over e-folding empirical cooling time (cool). We consider cool approximately equal to the derived conduction cooling time (tc) for the rising phase of the flare. Our dataset include 7 gradual (Rise time, tr > 150 sec) and 5 impulsive (tr <150 sec) events. We find Qf in impulsive flares between 0.25-0.62 suggesting that 25-62% energy of the accelerated electrons is utilized to produce SXR emission via CE while rest is released as non-thermal HXRs and other emission. However, for gradual flares Qf >1 indicates that additional SXR emission arises from pre-flare heating of the plasma. Estimation of thermal and non-thermal energy budgets requires measurement of break energy point (EB). We estimate EB, employing the relationship of tc with delay (Δt) in peak time of a given energy band relative to reference highest energy band (20-25 keV). This delay (Δt) acts as a probe of extent of thermal emission and saturates beyond EB. We find EB to vary between 17 and 22 ± 0.7 keV.

0046 On the apparent mystery of 23th solar cycle period

Valery Krivodubskij

Astronomical Observatory of Kyiv National Taras Shevchenko University, Kyiv, 04053, Ukraine

It is known that duration of the 23th solar cycle amounts to about 13 years and this value exceeds the averaged period of solar cycles (about 11 years). To find an explanation for this mystery of the 23th cycle period may derive on the base o Ωdynamo model of the solar cycle if we take into account the up-to-date observed data on the essential increase of averaged annual module of sunspot magnetic fields [Lozitskaya et al. 2007] and the magnetic quenching of the effect [Krivodubskij 2005]. The period of the solar cycle in Ωdynamo is defined by the expression T 2 /{(½) ∂Ω/∂r}$^{1/2}$, where is the turbulent helicity parameter in the solar convection zone (SCZ), and ∂Ω/∂r is the radial gradient of the inner solar rotation in the SCZ. The magnetic back reaction on the - effect could described by the decreasing (quenching) function of magnetic field intensity [Rüdiger and Kitchatinov 1993]. According to the study of Lozitskaya et al. [2007] the average values of sunspot magnetic field magnitudes in the 23th cycle are really higher (about 13%) then in three last cycles. In accordance this the value of the magnetic quenched - parameter in the maximum of the 23th cycle was equal about 0,7 its value in the minimum of the 23th cycle. In this case the calculated dynamo-period of the 23th cycle must be increaser in 1,2 times and will be about 13 years.

0047 Solar and Interplanetary Plasma Characteristics of Geo-effective flares associated with CMEs

Rajmal Jain, Subhash Kaushik, Nipa Bhatt, Arun Awasthi
Physical Research Laboratory, Ahmedabad, 380009 Gujarat, India

We probe the solar and interplanetary plasma characteristics of 77 Geo-effective flares associated with CMEs observed by "Solar X-ray Spectrometer (SOXS)" experiment onboard GSAT-2 Indian spacecraft and/ or by RHESSI mission. We analyze the X-ray spectra of these selected flares to measure solar plasma parameters such as electron temperature, emission measure, photon index etc. We measure the dynamics of the associated CMEs from the observations taken by EIT and LASCO onboard SOHO mission. The geo-effectiveness is measured in terms of Disturbed Storm Time (Dst) index, and spectra of solar energetic particles (SEPs). Our investigations show that flare+CME events observed in western hemisphere of the Sun are more likely to be geo-effective in agreement to Jain (1986). Accordingly, in the current sample of geo-effective events (Dst≤-50nT) we find 18 and 59 events in eastern and western hemisphere, showing correlation coefficient with Dst index of 0.59 and 0.97 respectively. However, magnitude of geo-effectiveness increases towards central meridian and Dst index reaches to ≤-150nT for the events occurring within ± 20^0 longitudes from central meridian. Our measurement of Fe/O ratio from SEP spectra of flare+CME events reveals the unusual behavior with energy. For the event of 26 August 2002, we find Fe/O ratio increasing with the energy, which, however, is in contrast to theoretical predictions. This suggests to probing unknown mechanism/s for particle acceleration in the interplanetary space.

0048 Flare-related sunspot 3D magnetic field evolution

S. Murray, D. S. Bloomfield, P. Gallagher
Trinity College Dublin, Dublin, Ireland

The evolution of the magnetic field in active region NOAA 10953 is examined over a period of 12 hours leading up to and after a GOES B1.0-class X-ray flare on 29th April 2007. Hinode/SOT-SP Stokes profiles are inverted using the HeLIX Milne-Eddington code before azimuth disambiguation and transformation to the solar surface reference frame. Variations in a number of magnetic field properties (e.g., total vertical and total horizontal field, total field strength, and average inclination angle) leading up to and after the flare are shown from different spatial locations within the active region.

0049 Magnetic Coverage, Complexity and Flare Activity in Solar Cycle 23

D. Shaun Bloomfield, Nicola Fitzsimons, Paul A. Higgins, Peter T. Gallagher
Trinity College Dublin, Dublin, Ireland

The well-known butterfly diagrams of sunspot number and area are decomposed into the contributions from active regions of differing Mount Wilson magnetic class. The Mount Wilson classifications are used to define a new numeric measure of magnetic complexity. The monthly occurrence of GOES X-ray flare events is compared to this complexity measurement in order to address the disparity between the sunspot and flare cycles.

0050 Evidence for the Return Meridional Flows in the Convection Zone from Latitude Motions of Sunspots

K.R. Sivaraman[1], H. Sivaraman[1], S.S. Gupta[1], R.F. Howard[1]
[1]Formerly of the Indian Institute of Astrophysics, Bangalore, Karnataka, India, [2]VMware, Palo Alto, California, United States, [3]Formerly of the Indian Institute of Astrophysics, Kodaikanal , Tamil Nadu, India, [4]National Solar Observatory,, Tucson , Arizona, United States

We have derived the latitude motions of sunspots classified into three area categories using the measures of positions and areas of their umbrae from the white - light images of the Sun for the period 1906 - 1987 from the Kodaikanal Observatory archives. The latitude motions are directed equator ward in all the three area classes. We interpret that these equator ward latitude motions reflect the meridional flows at the three depths in the convection zone where the magnetic loops of the spots of the three area classes are anchored. We obtain estimates of the anchor depths through a comparison of the rotation rates of the spots in each area class with the rotation rate profiles from helioseismic inversions. The equator ward flows measured by us thus provide evidence of the return meridional flows in the convection zone as required in the flux transport solar dynamo models. We have done an identical analysis using a similar data set derived from the photoheliogram collections of the Mt.Wilson Observatory for the period 1917 - 1985. There is good agreement between the results from the data sets of the two stations.

0051 Hard X-ray emission of solar flares in modern models of thick target

Pavel Gritcyk, Boris Somov
Sternberg Astronomical Institute, Lomonosov Moscow State University, Moscow, Russian Federation

One of the most complex processes occurring in solar flares is the acceleration of charged particles to high energies. In the majority of flares, electrons are accelerated in great numbers, and propagating along flare loops, give hard X-ray emission bursts with a power-law spectrum near Earth. Polarization of the hard X-ray emission of solar flares characterizes the angular distribution of fast electrons and their energy spectrum. On the other hand, evolution of the fast electrons distribution function along the flare loop is described by parameters of the distribution function in the source. In this work on the nonthermal interpretation of hard X-ray emission, we suggest that the thick target model with reverse current makes it possible to reconstruct the distribution function and the energy spectrum of accelerated electrons in a source by observing the spectrum and polarization of emission near Earth. The exact analytical approach to a solution of the problem of nonthermal electrons is made possible by finding the distribution function that was used to calculate the spectrum and polarization of hard X-ray emission. The presented model with reverse current was compared with the classical model without the effect of reverse current. All of our results have a visual presentation.

0052 On the North-South Asymmetry of Solar Phenomena during solar cycles 6-24

V. K. Verma
Uttrakhand Space Application Center, Dehradun-248006, Uttrakhand, India

In the solar N-S Asymmetry study we have used sunspots data, flare index data, H-alpha flares data and solar active prominences data for period 6-24 (years 1821-2010) solar cycles. Earlier Verma (1992) reported long-term cyclic period 11-12 solar cycles in N-S asymmetry and also predicted that the N-S asymmetry of solar activity phenomena during solar cycles 21, 22, 23 and 24 will be south dominated and the N-S asymmetry will shift to north hemisphere in solar cycle 25. The present study shows that the N-S asymmetry during solar cycles 22 and 23 are southern dominated as predicted by Verma (1992). The initial years (2008-2010) of solar cycle 24th are showing southern domination and confirm the result of Verma (1992). The 11 solar cycle's periodic behavior of the Sun may be related to internal structure of the Sun.

References:
Verma, V.K. (1992) ASPCS, 27, 429.

0053 Damping and the period ratio $P_1/2P_2$ of non-adiabatic slow mode

Nagendra Kumar[1], Anil Kumar[1]
[1]M.M.H. College, Ghaziabad, Uttar Pradesh, India, [2]VIET, G.B. Nagar, Uttar Pradesh, India

The fundamental period P_1 of an MHD mode contains information mainly about the average profile of the propagation speed of the mode. Higher harmonics carry more detailed information about a structure. Observations of standing waves have identified the fundamental harmonics of a vibrating loop, with evidence for higher harmonics. So we study the combined effect of thermal conduction, compressive viscosity and optically thin radiative losses on the period ratio, $P_1/2P_2$ (P_2 being the period of first harmonic) of a slow mode propagating one dimensionally. We model the coronal loop line-tied at footpoints located in photosphere. The effects of gravity and field-line curvature are neglected. We obtain the dispersion relation influenced by these non-ideal effects and use this to determine the period ratio $P_1/2P_2$. The dependence of period ratio on thermal conductivity, compressive viscosity and radiative losses has been shown graphically.

0054 The Solar Active Region Magnetic Field and Energetics

Qiang Hu[1], Na Deng[2], Debi Choudhary[2], B. Dasgupta[1], Jiangtao Su[3]
[1]CSPAR, University of Alabama in Huntsville, Huntsville, AL, United States, [2]California State University Northridge, Northridge, CA, United States, [3]National Astronomical Observatories, Beijing, China

Motivated by increasingly more advanced solar observations, we recently develop a method of coronal magnetic field extrapolation, especially for an active region (sunspot region). Based on a more complex variational principle, the principle of minimum (energy) dissipation rate (MDR), we adopt and solve a more complex equation governing the coronal magnetic field that is non-force-free in general. We describe the theoretical basis in the context of general solar atmosphere conditions, and derive the extrapolation approach utilizing vector magnetograms as bottom boundary conditions. In particular, we employ the vector magnetograms from multiple instruments, including Hinode, SOLIS, and HSOS, and at both photospheric and chromospheric levels for an active region. We discuss our results in the context of quantitative characterization of active region magnetic energy and magnetic topology. These quantitative analyses aid in better understanding and developing prediction capability of the solar activity that is largely driven by the solar magnetic field.

0055 The solar butterfly diagram of 1825-1867

Rainer Arlt[1], Anastasia Abdolvand[2]
[1]Astrophysikalisches Institut Potsdam, Potsdam, Germany, [2]Lycée Francais de Berlin, Berlin, Germany

Extending the solar butterfly diagram into the past has enormous implications for dynamo models explaining the solar magnetism. The continuous data set provided by the Royal Greenwich Observatory, USAF and NOAA goes back to 1874. We digitized the sunspot observations by Heinrich Samuel Schwabe from the period of 1825-1867. A total of 8466

full-disk drawings is available for positional measurements of the sunspots. Besides the heliographic positions, we also estimate the umbral area of the sunspots. Also the group numbering provided by Schwabe is preserved, which is the same type of numbering as in the Greenwich data. We present the butterfly diagram of the period of 1825-1867 derived from a first scan with about 10% of the available data. We are very grateful for the support from the Royal Astronomical Society in the digitization of the manuscripts.

0056 Acoustic Wave in Solar Prominence

Ken Nakatsukasa
California State University, Northridge, Northridge, California, United States

Acoustic waves within a torsional quiescent prominence were investigated with Solar Optical Telescope on board of Hinode satellite. Continuous observations were made in Ca II H line from ~15:00 UT May 03, 2008; the observational duration was ~1hr with a cadence time ~30s. The emission intensity in terms of altitude and time shows periodic fluctuations in brightness; fourier power spectrum indicates the presence of frequency and wavelength to be ~6min and ~3.6Mm respectively. These parameters yield the propagation speed approximately ~10km/s which is close to the sound speed signifying this intensity disturbances are likely longitudinal magnetoacoustic waves traveling from one foot point to the other along the prominence loop. In addition, the comparison between the characteristics of slow waves in the prominence and coronal loops was made; the differences and similarities are discussed in details.

0057 Emergence Patterns in the Physical Properties of Solar Active Regions Over Solar Cycle 23

Paul A. Higgins, Peter T. Gallagher, D. Shaun Bloomfield
Trinity College Dublin, Dublin, Ireland

The solar cycle dependence of global active region (AR) emergence and dynamics is analysed using the SolarMonitor Active Region Tracker (SMART), which automatically detects and characterises magnetic flux concentrations using full-disk magnetograms. SMART is run on a magnetogram data set ranging from 1997 to 2009, resulting in measurements of each AR on disk each day. AR properties such as heliographic location, orientation, magnetic flux, flux imbalance, Schrijver's R value, Falconer's WL_{sg} proxy for non-potentiality, and flare productivity are compared over cycle 23. We find several solar cycle modulations in the globally summed AR flux which may help to characterize the subsurface solar dynamo as well as global magnetic flux transport. The global flare index is better correlated to the global R value than WL_{sg} or magnetic flux. Also, the emergence of highly non-potential, flare-productive ARs is found to more confined in latitude than ARs in general, with little dependence on the phase of the solar cycle.

0058 Excitation of acoustic waves in network magnetic elements

Yoshiaki Kato[1], Oskar Steiner[2], Matthias Steffen[3], Yoshinori Suematsu[4]
[1]ISAS/JAXA, Sagamihara, Japan, [2]Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany, [3]Astrophysikalisches Institut Potsdam, Potsdam, Germany, [4]NAOJ, Mitaka, Japan

From radiation magnetohydrodynamic (RMHD) simulations we track the temporal evolution of a vertical magnetic flux sheet embedded in a two-dimensional non-stationary atmosphere that reaches all the way from the upper convection zone to the low chromosphere. Comparing the power spectra of the temperature from the flux-sheet interior to a comparable region outside it we find strong power enhancement in the lower-chromosphere above the magnetic element in the 2-min range. We find that the excitation of the propagating longitudinal waves in the magnetic element that causes this power enhancement is due to downflows in the vicinity but outside the magnetic flux concentration in the top layers of the convection zone. These downflows are most of the time present but highly intermittent in nature and they act on the plasma confined in the magnetic element by a process known as “magnetic pumping" (Parker, 1974). We identify magnetic pumping as a significant source of acoustic power for network magnetic elements.

0059 Solar flare forecasting using kernel logistic regression based on sunspot groups classification and photospheric magnetic measures

YUAN YUAN, Frank Shih, Ju Jing, Haimin Wang
New Jersey Institute of Technology, Newark, NJ, United States

Previous research has demonstrated that there exists statistical correlation between photospheric magnetic measures and solar flares. And sunspot groups classification has long been used as an indicator of solar flare activities. To combine the prediction power of photospheric magnetic measures and sunspot groups classification together, we can achieve better solar forecasting. However, since sunspot groups classification is a qualitative measure but photospheric magnetic measures are quantitative measures, it is not straightforward to combine them in solar flare forecasting. In this paper, we design a kernel augmented logistic regression method to tackle the challenge. Compared with other popular forecasting method such as support vector machine (SVM) and neural networks (ANN), our method can achieve similar performance, at the same time, our method performs a probability forecasting which is of monumental importance to solar flare forecasting.

4. Formation and evolution of star spots

0060 Using SONG to Probe Rapid Variability and Evolution of Starspots

James Neff[1], Travis Metcalfe[1]
[1]College of Charleston, Charleston, SC, United States, [2]UCAR/HAO, Boulder, CO, United States

The Stellar Observations Network Group (SONG) is being developed as a

network of 1-meter spectroscopic telescopes designed for and primarily dedicated to asteroseismology. It is patterned after the highly successful GONG project. The Danish prototype telescope will be installed in Tenerife in early 2011. Ultimately we hope to have as many as 8 identical nodes providing continuous high-resolution spectroscopic observations for targets anywhere in the sky. The primary scientific goals of SONG are asteroseismology and the search for Earth-mass exoplanets. The spectroscopic requirements for these programs push the limits of current technology, but the resulting spectrograph design will enable many secondary science programs with less stringent requirements. Doppler imaging of starspots can be accomplished using continuous observations over several stellar rotations using identical instrumentation at each node. It might be possible to observe the evolution of starspot morphology in real-time, for example. We will discuss the design and status of the SONG project in general, and we will describe how SONG could be used to probe short timescale changes in stellar surface structure.

5. Stellar magnetism

0061 Search for Super Saturation in late type Stars

Tersi Arias, Damian Christian
California State University Northridge, Northridge, CA, United States

The Sun is a star viewed by us for only a brief period of its evolution, and studying objects that are younger and older than the Sun can help us understand its past and future activity. For example, we can better comprehend the solar magnetic dynamo by investigating how it behaves in smaller faster rotating stars. We research the activity of this type of stars in the young open clusters Alpha Persei, IC 2391, and IC 2602 which contain main-sequence late type stars that are fast and ultra-fast rotators (> 20km s-1 and > 100km s-1 respectively) from which Ca II H & K emission lines can be detected as a signature of magnetic and chromospheric activity. We are searching for the super-saturation effect seen in x-ray wavelengths, observed as a decline in flux with respect to increasing rotational speed and decreasing Rossby number. To do so, we analyze optical spectra of a large sample of these rotators from the three star clusters mentioned above and other stars from the solar neighborhood. The star samples were observed with the Isaac Newton 2.5 meter telescope and IDS spectrograph and the Blanco 4 meter telescope and R-C spectrograph at CTIO respectively. We find that the measured flux from the chromospheric emission of Ca II H & K from these stars shows no evidence of decline in optical flux as a function of increased rotational velocity or smaller Rossby number, in contrast to the results of the x-ray studies.

6. Star spots and stellar activity

0062 The absolute parameters for NSVS\,118668841 and the oversized stars in the low-mass eclipsing binaries

Omur Cakirli[2], Cafer Ibanoglu[1], Ahmet Dervisoglu[1], Zeki Eker[2], Tansel Ak[2]
[1]Ege Üniv., izmir, Turkey, [2]TUG-TUBITAK Ulusal Gözlemevi, Antalya, Turkey

Spectroscopic observations of the low-mass eclipsing binary NSVS\,118668841\ have been obtained and the radial velocities were derived for both components. The existing VRI light curves and the new radial velocities are modelled to measure the absolute physical parameters of the components. The masses and radii determined for the components. While the primary star's radius determined from the light curves analysis agrees well with that of calculated from the observed rotational velocity, the secondary star's radius found from the light curves is almost 50 per cent larger than that estimated from the rotational velocity. This discrepancy may be arisen from the large spot coverage of the less massive star when the time light curves were obtained. We collected absolute parameters of 28 low mass double-lined eclipsing binaries and compared their positions in the mass-radius and mass-effective temperature panels. The observed radii are generally larger, in contrary, the effective temperatures are lower than the theoretical expectations. These discrepancies are solved neither with difference in metallicity nor in mixing length parameters. Therefore, the observed larger radii and cooler effective temperatures in the low mass stars with respect to the models may be originated by magnetic fields causing inhibition convective energy transport which leads to large magnetic spot coverage on the surface of a low mass star. Fast rotation or magnetic field induced inhibition of convection reduces heat flow and, thus, a star compensate this reducing energy output by enlarging its radius.

0063 Optical polarimetry and photometry of young sun-like star LO Peg

J. C. Pandey
Aryabhatta Research Institute of Observational Sciences, Nainital, Uttarakhand, India

LO Pegasi (spectral type K3V) is a cooler, younger and fast rotator than the Sun. We have carried out the polarimetric study of this star for the first time. Our analyses reveal that LO Peg is highly polarized among the sun-like stars. The degree of polarization and polarization position angle are fond to be rotationally modulated. The levels of polarization observed in LO Peg could be the result of scattering of an anisotropic stellar radiation field by an optically thin circumstellar envelope or scattering of the stellar radiation by prominence-like structures. The long term photometric observations of LO Peg indicate the presence of two independent group of spots.

0064 On SH Molecules in the Umbral Spectra

Krishnanand Sinha
Aryabhatta Research Institute of observational sciencES, Manora Peak, Nainital, Uttarakhand, India

Based on our predictions on detectability, very weak lines of the molecules SH have recently been identified in the photospheric spectrum of the Sun. This is the first detection of a mercapto radical in the solar spectrum. It helps place confidence in the solar abundance of Sulfur. Additionally, the observations tested the band oscillator strength for the detected ultraviolet transition for which no laboratory measurements are available.

Sunspots being cooler than the photosphere are the hosts to a large number of molecular species. However, owing to scattered photospheric radiation, the discoverers could not detect the lines of SH in the sunspot spectrum that are expected to show larger than the photospheric equivalent widths (EWs in short). Detection of weak lines in photosphere coupled with a no-detection of the relatively strong same lines in the sunspot spectrum might cause doubts on the detection itself.

The above problem is investigated here in detail with a choice on photospheric and sunspot models and micro-turbulence values. The new results based on a tested method of calculations indicate that the predicted sunspot lines are about half intense than reported before but the lines remain detectable. It is concluded that the SH lines are observable and may be detectable in a clean region of the sunspot spectrum. A need for a laboratory determination of oscillator strengths is felt.

0065 Surface evolution in stable magnetic fields: the case of the fully convective dwarf V374 Peg

Krisztián Vida
Konkoly Observatory, Budapest, Hungary

We present $BV(RI)_C$ photometric measurements of the dM4-type V374 Peg covering ~430 days. The star has a mass of ~0.28M_{Sun}, so it is supposed to be fully convective. Previous observations detected almost-rigid-body rotation and stable, axisymmetric poloidal magnetic field. Our photometric data agree well with this picture, one persistent active nest is found on the stellar surface. Nevertheless, the surface is not static: night-to-night variations and frequent flaring are observed. The flares seem to be concentrated on the less-spotted part of the surface. The short-time changes of the light curve could indicate emerging flux ropes in the same region, resembling to the active nests on the Sun. We have observed flaring and quiet states of V374 Peg changing on monthly timescale.

0066 On Great X-ray Flares and other Solar Phenomena

V. K. Verma
Uttarakhand Space Application Center, Dehradun, Uttarakhand, India

We present a study of ≥X1.0 soft X-ray flares with other solar phenomena which are observed during interval of January 01, 1996 to December 31, 2007 and we call these flares as great soft x-ray (GSXR) flares. During this period, a total number of 126 GSXR flares were observed which were used for studying relationship of GSXR flares with H flares, hard X-ray(HXR) bursts, microwave (MW) bursts at 15.4 GHz, type II /IV radio bursts, coronal mass ejections (CMEs) ,proton flares (>10Mev) and ground level enhancement (GLE) events. We find that about 84%. 93%, 98%, 69%, 62%, 54%, 76.2%, 48.4%, 23%% and 11.1% GSXR flares are related/ associated with observed H-alpha flares, HXR bursts, MW bursts at 15.4 GHz, type II radio bursts, type IV radio bursts, both type II /IV radio bursts, CMEs, halo CMEs, proton lares (>10Mev) and GLE events. In the paper we have studied the onset time delay between GSXR and H flares, HXR, MW, type II radio bursts, type IV radio bursts, CMEs, halo CMEs, protons flares and GLE events are 0-5 min, 0-3 min, 2-5 min, 1-15 min, 1-20 min, 21-40 min, 21-40 min, 1-4 hrs and 21-30 min, respectively. Here we conclude that since during significant number of flares triggering are first observed from location SXR loop in corona and other emissions like HXR, H ,MW etc followed SXR emissions therefore flares triggering through reconnection, initiate in the corona and then move towards chromospheres/photosphere to trigger HXR and H emissions.

0067 A simple nonlinear model for the rotation of cool stars

Sydney Barnes
Lowell Observatory, Flagstaff, United States

A simple nonlinear model is proposed here to describe the rotational evolution of main sequence cool (FGKM) stars. It is formulated only in terms of the ratio of a star's rotation period, P, to its convective turnover timescale, tau, and two dimensionless constants which are specified using solar- and open cluster data. The model describes the evolution of stars from C-type (saturated) to I-type (unsaturated) through the rotational gap, g, separating them. The problem can be described most succintly in non-dimensional variables. The proposed model explains various aspects of stellar rotation and provides an exact expression for the age of a rotating cool star in terms of P and tau, thereby generalizing gyrochronology. The time interval expended in reaching the C/I transition is 0-180 Myr for solar-mass stars of varying initial periods, 2-4 Gyr for M stars, and decreases rapidly towards zero for stars more massive than the sun. Beginning with the range of initial periods indicated by observations, we show that the (mass-dependent) dispersion in rotation period initially increases, and then decreases rapidly with the passage of time. It contributes upto 127 Myr to the gyro age errors of solar mass field stars, minor for solar-age stars, but younger and cooler field stars are impacted more. Finally, we transform to color-period space, calculate appropriate isochrones, and show that this model explains some detailed features in the observed color-period diagrams of open clusters, including the positions and shapes of the sequences, and the observed density of stars across these diagrams.

0068 Doppler images of the RS CVn binary II Pegasi during the years 2004-2010

Marjaana Lindborg[1], Maarit Korpi[1], Thomas Hackman[1], Ilkka Tuominen[1], Ilya Ilyin[2], Nikolai Piskunov[3]
[1]University of Helsinki, Helsinki, Finland, [2]Astrophysikalisches Institut Potsdam, Potsdam, Germany, [3]Uppsala University, Uppsala, Sweden

The activity phenomena, such as sunspots, flares, and prominences, observed on the Sun, are all related to the solar magnetic field. The sunspots cover a relatively small fraction of the solar surface, and occur rather near the equator, showing a 22-year magnetic cycle during which the amount and polarity of the spots change. Stars that rotate more rapidly than the Sun show stronger magnetic activity levels. Their surface features can be studied with the help of spectroscopy or spectropolarimetry through the Doppler imaging technique (e.g. Piskunov et al. 1990): starspots cause small bump-like distortions in the spectral line profiles as the star roatates. This information can be inverted to a temperature map of the stellar surface. We present the new surface maps of the RS CVn binary II Pegasi during the years 2004-2010.

0069 A novel approach to quantifying chromospheric activity in T Tauri stars

Morag Hastie[1], Mark Casali[2], Matt Ashley[3]
[1]MMT Observatory, Tucson, AZ, United States, [2]European Southern Observatory, Garching, Germany, [3]University of New South Wales, Sydney, Australia

It has long been known that pre-main sequence stars exhibit regions of magnetic activity on their surfaces similar to ones observed on the Sun. However, the extent to which these regions cover the stellar surfaces is not yet well understood. Most spectral classification methods rely on moderate-resolution optical spectra whose features arise primarily from the non-active, hotter photosphere. Effective temperatures derived using these spectral types may then be overestimated if a large portion of the surface is covered in active regions, leading to substantial errors in mass and age calculations.

This work presents a novel approach which aims to overcome the limitations of other observing techniques (e.g. Doppler imaging) in quantifying the distribution of magnetic regions on a large sample of active stars. Using simultaneous optical spectroscopic and photometeric observations of a significant sample of fast rotating T Tauri stars and simple computer simulations, we demonstrate that these young stars have upwards of 50% of their surfaces covered with active magnetic regions.

0070 The Dependence of Maximum Starspot Amplitude and the Amplitude Distribution on Stellar Properties

Steven Saar[1], Michelle Dyke[2], Soeren Meibom[1], Sydney Barnes[3]
[1]SAO, Cambridge, MA, United States, [2]Yale University, New Haven, CN, United States, [3]Lowell Obs., Flagstaff, AZ, United States

We combine photometric data from field stars, plus over a dozen open clusters and associations, to explore how the maximum photometric amplitude (A_{max}) and the distribution of amplitudes varies with stellar properties. We find a complex variation of A_{max} with inverse Rossby number Ro^{-1}, which nevertheless can be well fit with a simple model including an increase in Amax with rotation for low Ro-1, and a maximum level. A_{max} is then further affected by differential rotation and a decline at the highest Ro^{-1}. The distribution of A_{spot} below A_{max} varies with Ro^{-1}: it peaks at low A_{spot} with a long tail towards A_{max} for low Ro^{-1}, but is more uniformly distributed at higher Ro^{-1}. We investigate further dependences of the A_{spot} distributions on stellar properties, and speculate on the source of these variations.

7. Observational techniques

0071 Data Analysis in Numerical Models of the Solar Corona

Antonio Pasqua
University of Manchester, Manchester, United Kingdom

This work was dedicated to the problem of the physical mechanisms that are responsible for the heating of the solar corona. In particular, I worked on the propagation and dissipation of Alfvénic fluctuations within the magnetic structures of the corona. I studied how such fluctuations interact with spatial inhomogeneities that are intrinsic in these structures, transferring the fluctuating energy to increasingly small scales, where it is dissipated. I calculated the Kolmogorov entropy of magnetic lines in some model structures (this quantity is an indicator of the rate of small scale generation) as well as its statistical distribution as a function of the altitude and of the parameters characterizing the model structure.

0072 The Effects of Star Spots on Transit Photometry

John Hodgson II, Damian Christian
California State University, Northridge, Northridge, California, United States

We have undertaken an observational program to photometrically monitor several transiting planet host stars. The Rabus et al. result for TrES-1 showed the dramatic effects star spots can have on transit photometry. We will investigate the effects of spots on transit light curves and radii estimates. The observed spot patterns will be used to derive the rotational periods of our sample. Our sample includes several of the newly discovered transiting ESPs from the SuperWASP, HAT, and Kepler projects, such as K5 host star WASP-10, K1 host star WASP-1, K4 host star HAT-P-11, and G1 host star Kepler-6.

0073 The Kepler Guest Observer Program

Martin Still, Mike Fanelli, Karen Kinemuchi
NASA Ames Research Center, Moffett Field, CA, United States

The Kepler spacecraft, launched on Mar 6, 2009, monitors 150,000+ stars with continuous 1- and 30-min temporal sampling. Kepler's primary science objective is exoplanet detection, with particular focus on terrestrial planets within habitable zones. The 115 square degree field of

view is located within the Cygnus-Lyra region and will be continuously monitored throughout the full mission. The nominal magnitude range for Kepler science of is *Kp* = 9−15 for the primary program, although justifiable targets as bright as *Kp* 5 and as faint as *Kp* 20 will be considered for Guest Observer (GO) use. The one instrumental bandpass is broad, from 420 to 900 nm and the point spread function is approximately 6 arc seconds (FWHM). Photometric precision is ~50 parts per million for a *Kp* = 12 magnitude G2V star integrating for 30 minutes. With a baseline mission of 3.5 years and an option for an additional 2 year extension, the resulting data archive will provide a unique combination of photometric precision, duration, contiguity and source volume. The cool star community have opportunities to both develop observing programs and mine this rich data set for astrophysical results. The Kepler Guest Observer Office is dedicated to the service of the broad science community, with a charter to promote the exploitation of Kepler data and broaden the scientific impact of this mission.

8. Unified approach in understanding Sun and star spots

0074 Activity-Brightness Correlations for the Sun

Dora Preminger, Gary Chapman, Angie Cookson
San Fernando Observatory CSUN, Northridge, CA, United States

We examine the effects of active regions on the brightness of the solar disk using two solar cycles' worth of photometric images from the San Fernando Observatory. The data show that while spectral line emission from the chromosphere is enhanced by the presence of active regions, continuum radiation from the photosphere is diminished. An inverse correlation between continuum brightness and solar activity exists on both rotational and solar cycle timescales. We can successfully model the variability of the Sun's bolometric brightness as the sum of the contributions of spectral line and continuum variability, but there is no simple relationship between bolometric and continuum brightness. Our blue and red continuum filters are quite similar to the Stromgren b and y filters used to measure stellar photometric variability. Sun-like stars whose continuum brightness varies inversely with activity are therefore revealed to be similar to the Sun.

0075 Solar Spectroscopy at ARIES

Krishnanand Sinha
Aryabhatta Research Institute of observational sciencES, Manora Peak, Nainital, Uttarakhand, India

Identification of Fraunhofer lines with known atomic and molecular absorbers and predictions leading to such efforts have been a challenging area of study crowned with occasional success. Such studies have additionally led to (i) a
determination of abundances of elements and their isotopes (ii) valuable information on model atmospheres and (iii) use of Sun as a “laboratory source”. With the above in view, *Solar Spectroscopy* has vigorously been pursued for more than four decades at the Aryabhatta Research Institute of observational sciencES (ARIES). The work, with a view to pick up new and interesting areas for future investigations is reviewed here in the light of tremendous progress made elsewhere in observations of the Sun and in the laboratory studies.

0076 Interplanetary Plasma Variability and their impact on Geomagnetic Field

Vidya Charan Dwivedi
APS UNIVERSITY, REWA, India

The interplanetary plasma parameters used for the study of solar-terrestrial relationships. Both, hourly and daily values of these parameters have usually been employed to associate with parameters defining terrestrial effects. For the reported study, we have used the daily average values of the interplanetary indices (V, B, Bz, T, and N), as well as that of the Ap index, for the years 1965 to 2010. The averages have been calculated by choosing only those days for which simultaneous data is available for all these parameters (V, B, Bz, T, N and Ap). These include their yearly averages as well as the averages on the basis of the phases of the solar activity cycle. The statistical relationship between them has been investigated on these long-term averages, as well as on the day-to-day basis. (i) V vs Ap has always low values of correlation coefficient (r). (ii) on the contrary, B vs Ap has high values of ‘r', (iii) the product of V and B vs Ap always yields much better correlations than for V or B alone, either on an average basis, or on a day- to- day basis, and (iv) eventhough, the long-term variations of V are not very significant, the variations of B follow solar activity cycle and has a continuously increasing trend during the solar cycles 20 and 21. The statistical results obtained here signify that VB is the most effective parameter in producing large scale geomagnetic disturbances.

Index of Speakers

Index of Poster Authors

IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

POST MEETING REPORT FORM

1. Meeting Number: **274**

2. Meeting Title: **Advances in plasma astrophysics**

3. Coordinating Division**: II "Sun & Heliosphere"**

4. Location (city, country): **Giardini Naxos, Italy**

5. Dates of meeting: **6-10 September 2010**

6. Number of participants: **164**

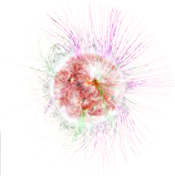
7. List of represented countries: **Italy, France, UK, Ireland, Spain, Belgium, Denmark, Germany, Poland, Czeck Republic, Sweden, Finland, Norway, Russia, Georgia, Ukraine, Tajikistan, Serbia, Greece, Turkey, Egypt, India, China, Japan, Australia, USA, Brazil, Argentina, Mexico**

8. Report submitted by: **Alfio Bonanno**

9. Date and place: Catania, 24 January 2011

10. Signature of SOC Chairperson:

INAF - Osservatorio Astrofisico di Catania
Via Santa Sofia, 78 I-95123 Catania, Italy Tel.: +39- 095-7332 111 Fax: +39-095-330592
Sede "Mario G.Fracastoro" (Etna) – Tel +39-095-911580 Fax+39-095-916184
www.oact.inaf.it



IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

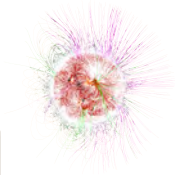
FINAL SCIENTIFIC PROGRAM IAUS274 – 6-10, Sept, 2010

Sunday 5
17:00–19.00: Registration
19:00: Welcome cocktail

Monday 6
8:30: Registration
8:45–09.00: Welcome
KEYNOTE TALK
9:00–09:30: S. Colgate (Los Alamos Nat. Lab.): *The Magnetized Universe: its origin and dissipation through acceleration*
MORNING SESSION: PLASMA ASTROPHYSICS IN LABORATORY
09:30–10.00: M. Yamada (Princeton Univ.): *Study of physics of magnetic reconnection in a laboratory plasma*
10:00–10:15: G. Haerendel, (MPIE, Garching): *Magnetic fractures or reconnection of type II*
10:15–10:30: C. Watts (Univ. of New Mexico): *Laboratory generated coronal mass ejections*
10:30–11:00: Coffee break
11:00–11:30: T. Tajima (MPA-Munich): High-energy, high-field astrophysics
11:30–12:00: S. Lebedev (Imperial College, London): Laboratory simulations of astrophysical jets
12:00–12:30: H. Ji (Princeton): Future prospects for MRI experiments
12:30–15:00: Lunch break
AFTERNOON SESSION: INTERSTELLAR, SPACE AND PLANETARY PLASMAS
15:00–15:30: J. Drake (Univ. of Maryland): Particle acceleration during reconnection
15:30–16:00: A. Lazarian (Univ. of Wisconsin): ISM turbulence and fast reconnection
16:00–16:15: M. Hirai (Univ. of Tokyo): Nonthermal ion acceleration in magnetic reconnection: magnetospheric observations and particle simulations
16:15–16:30: A. Beresnyak (Univ. of Wilsconsin-Madison): Imbalanced MHD turbulence
16:30–17:00: A. Johansen (Lund Observatory): Magnetic fields and planetary formation
17:00-17:30: Coffee break
17:30–17:45: N. Dzyurkevich (MPA, Heidelberg): MRI turbulence and 'dead' zones in protoplanetary disks: 3D global simulations
17:45–18:00: I. Roth, (UC Berkeley): Relativistic electron acceleration, magnetic reconnection and whistler bootstrap
18:00–18:15: S. Ibadov, (IofA, Tajik): Plasma astrophysics implication in discovery and interpretation of X-ray radiation from comets
18:15–18:30: A. Petrosyan (Space Res. Inst. RUSSIA): Large Eddy Simulations in plasma astrophysics.
Weakly compressible turbulence in local interstellar medium
18:30–19:00: Poster & Discussion session

Tuesday 7

INAF - Osservatorio Astrofisico di Catania
Via Santa Sofia, 78 I-95123 Catania, Italy Tel.: +39- 095-7332 111 Fax: +39-095-330592
Sede "Mario G.Fracastoro" (Etna) – Tel +39-095-911580 Fax+39-095-916184
www.oact.inaf.it



IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

MORNING SESSION: SOLAR AND STELLAR PLASMA

09:00–09:30: W. Matthaeus (University of Delaware): Observations of solar wind turbulence and connections to MHD relaxation, intermittency and dissipation

09:30–10:00: J. Büchner (MPI-Lindau): Kinetic processes in solar and stellar coronae from micro turbulence to large scale reconnection

10:00–10:15: P. Browning (Jordrell Bank Center): Heating of the solar corona by relaxation triggered by nonlinear kink instability

10:15–10:30: D. Pascoe (Univ. of St Andrew): Coupled Alfvén and kink oscillations in an inhomogeneous corona

10:30–11:00: Coffee break

11:00–11:30: S. Berdyugina (KIS): Magnetic fields across the HR diagram

11:30–11:45: I. Kitiashvili (Stanford University): Realistic MHD simulations of magnetic self-organization in solar plasma

11:45–12:00: A. Greco (Univ. della Calabria): Emergence of intermittent structures and reconnection in MHD turbulence

12:00–12:15: B. Kliem (Univ. of Potsdam): Helicity transport in a simulated CME

12:15–12:30: F. Spanier (Univ. of Wüerzburg): Nonlinear Plasma Wave Interactions in the Solar Corona

12:30–13:00: K. Shibata (Kyoto Univ.): Plasma processes in solar and stellar flares

13:00–15:00: Lunch break

AFTERNOON SESSION: PLASMA AROUND COMPACT OBJECTS

15:00–15:30: D. Melrose (Univ. of Sydney): Plasma processes in pulsar magnetospheres

15:30–16:00: E. Waxman (Weizmann Institute): Plasma physics of gamma ray bursts

16:00–16:15: J. Gil (Kepler Institute of Astronomy): Partially screened polar gap in pulsars

16:15–16:30: G. Melikidze (Kepler Institute of Astronomy): *The radiative processes in the relativistic pair plasma: application to pulsars*

16:30–17:00: T. Terasawa (Tokyo Institute of Technology): *Collisionless shock and particle acceleration*

17:00–17:30: Coffee break

17:30–17:45: R. Lovelace (Cornell University): *Large-scale magnetic fields in accretion disks*

17:45–18:00: M. Lemoine (Institut d'Astrophysique de Paris): *Electromagnetic instabilities at relativistic*
collisionless shocks and Fermi acceleration

18:00–18:15: V. Kocharovsky (Inst. of Appl. Phys.): Self-channeling of low-frequency electromagnetic waves and plasma stratification in astrophysical jets

18:15–18:30: K. Fujisawa (Univ of Tokyo): Stationary and axisymmetric configurations of compact stars with extremely strong and highly localized magnetic fields

18:30–18:45: C. Cremaschini (SISSA): Theory of quasi-stationary kinetic dynamos in magnetized accretion discs

18:45–19:15: Poster & Discussion session

Wednesday 8

MORNING SESSION: OBSERVATIONAL AND MODELLING PROGRAMS FOR PLASMA ASTROPHYSICS

09:00–09:30: R. Rosner (Chicago univ.): Key problems of Plasma Astrophysics

09:30–10:00: N. Mandolesi (INAF-IASF): The Planck Mission

10:00–10:30: K. Strassmeier (AIP-Potsdam): Recent advances in spectropolarimetry and the prospects
for the European Extremely Large Telescope

10:30–11:00: Coffee break

INAF - Osservatorio Astrofisico di Catania
Via Santa Sofia, 78 I-95123 Catania, Italy Tel.: +39- 095-7332 111 Fax: +39-095-330592
Sede "Mario G.Fracastoro" (Etna) – Tel +39-095-911580 Fax+39-095-916184
www.oact.inaf.it

11:00–11:15: A. Kosovichev (Stanford University): Investigations of solar plasma in the interior and coronafrom Solar Dynamics Observatory
11:15–11:30: F. Zuccarello, (Univ. of Catania): The EST Project
11:30–11:45: G. Fleishman (New Jersey Institute of Technology): New interactive solar flare modeling and advanced radio inversions tools
11:45–12:00: G. Molodij (Obs. of Meudon): Spectropolarimetry of solar fine structures
12:00–12:15: J. Warnecke (NORDITA): Surface appearance of dynamo-generated large-scale fields
12:15–12:30: L. Vlahos (Aristotle University): The solar flare: a strongly turbulent particle accelerator
12:30–12:45: Y. Tsap (Crimean Observatory): Ambipolar diffusion" and magnetic reconnection
12:45–13:00: J. Podesta (Los Alamos Nat. Lab): Solar wind turbulence: advances in observations and theory
13:00–14:00: Lunch break
14:00 - 21:00: Excursion to Syracuse

Thursday 9
MORNING SESSION: PLASMAS IN GALAXIES AND GALAXY CLUSTERS
09:00–09:30: J. Lominadze (Georgian Academy of Science): Instabilities in astrophysical rotating plasma
09:30–10:00: R. Beck (MPIfR): *Magnetism in Galaxies: observational overview and next generation radio telescopes*
10:00–10:30: M. Hanasz (Nicolaus Copernicus University): Cosmic-ray driven dynamo in galaxies
10:30–11:00: Coffee break
11:00–11:30: O. Gressel (Queen Mary University): Galaxy dynamo by supernova-driven interstellar turbulence
11:30–12:00: E. de Gouveia Dal Pino (Univ. of S. Paulo): Magnetic field transport by MHD turbulence (and its role on star formation)
12:00–12:15: F. Del Sordo (NORDITA): Turbulent diffusion and galactic magnetism
12:15–12:30: B. Burkhart (University of Wisconsin-Madison): Statistical measures of turbulence in magnetized plasma
12:30–12:45: M.Cardaci (UAM): *An XMM-Newton view of small sample of Seyfert 1 Galaxies*
12:45–13:00: K.Otmianowska-Mazur (Jagiellonian Univ):3D numerical simulation of magnetic field evolution in barred galaxies and in spiral galaxies under the influence of tidal forces
13:00–15:00: Lunch break
15:00–15:30: G. Rüdiger (AIP, Potsdam): The Tayler instability and MRI in laboratory experiments
15:30–16:00: L.Feretti (INAF - IRA): Relativistic plasma and ICM/Radio galaxy interaction processes
16:00–16:30: K. Dolag (MPA - Garching): Magnetic fields in galaxy Clusters
16:30–17:00: Coffee break
17:00–17:15: G. Piccinelli (UNAM): Ferromagnetic Properties of condensed W bosons in the Early Universe
17:15–17:30: G. Burigana (INAF - IASF): On the solution of the Kompaneets equation in cosmological context:
a numerical code to predict the CMB spectrum under general conditions
17:30–17:45: H. Yan (Kavli Institute): CR Transport through gyroresonance instability in compressible turbulence
17:45–18:00: H. Lesch (Univ. Observatory Munich): Simulating Magnetic Fields in Interacting Galaxies

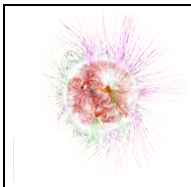
18:00–18:15: H. Siejkowski (Jagiellonian Univ.): Global 3D model of magnetic fields evolution in dwarf irregular galaxies
18:00–19:00: Poster & Discussion session

Friday 10

MORNING SESSION: PLASMA ASTROPHYSICS IN NUMERICAL SIMULATIONS

09:00–09:30: J. Stone (Princeton Univ.): Large domains, stratified disks, and anisotropic viscosity in shearing box simulations
09:30–10:00: A. Brandenburg (NORDITA): Numerical simulations of astrophysical dynamo
10:00–10:15: M. Pessah (IAS): On the saturation of the magnetorotational instability via parasitic modes
10:15–10:30: R. Arlt (AIP-Potsdam): The Tayler instability as a dynamo driver
10:30–11:00: Coffee break
11:00–11:30: A. Nordlund (Niels Bohr Institute): Radiation from relativistic shocks and MHD turbulence
11:30–11:45: Y. Mizuno (UA, Huntsville): Magnetic field amplification by relativistic shocks in inhomogeneous medium
11:45–12:00: D. Gomez (UBA): Three-dimensional simulations of Hall MHD dynamos
12:00–12:15: J. Niemiec (Inst. of Nucl. Phys. PAS): Kinetic studies of wave-particle interactions in particle acceleration at shocks
12:15–12:30: R. Keppens (CPA, Leuven): Shock refraction from classical gas to relativistic plasma environments
12:30–14:00: Lunch break
14:00–14:30: M. Romanova (Cornell Univ.): Global simulations of disk-magnetosphere interactions: accretion, outflows and variability
14:30–15:00: A. Ferrari (Univ. of Turin): Launching mechanisms and propagation effects of relativistic astrophysical jets
15:00–15:15: M. Bocchi (Imperial College London): Numerical study of jets produced by conical wire arrays on the Magpie pulsed power generator
15:15–15:30: V. Zharkova (Univ. of Bradford): Particle acceleration in a single 3D RCS: test particle versus PIC approach
15:30–15:45: J. Matsumoto (Univ of Kyoto): Special relativistic magnetohydrodynamic simulation of two-component outflow powered by magnetic explosion on compact objects
15:45–16:00: S. Yoshida (Univ. of Tokyo): Stationary and axisymmetric magnetized equilibria of stars and winds
16:00 Closing remarks & farewell coffee break: Alfio Bonanno, Elisabete M. de Gouveia Dal Pino & Alexander Kosovichev

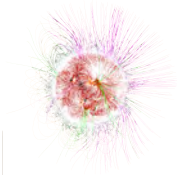
INAF - Osservatorio Astrofisico di Catania
Via Santa Sofia, 78 I-95123 Catania, Italy Tel.: +39- 095-7332 111 Fax: +39-095-330592
Sede "Mario G.Fracastoro" (Etna) – Tel +39-095-911580 Fax+39-095-916184
www.oact.inaf.it



IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

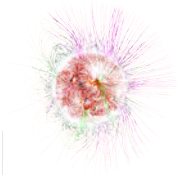
List of Participants

Antonello	Anzalone	INFN LSN-Catania,ITALY	anzalone@lns.infn.it
Rainer	Arlt	Astrophysikalisches Institut Potsdam, GERMANY	rarlt@aip.de
Rainer	Beck	Max-Planck-Institut fuer Radioastronomie, GERMANY	rbeck@mpifr-bonn.mpg.de
Gaetano	Belvedere	Astrophysical Section, Dept. of Physics and Astronomy, Univ. of Catania, ITALY	gbelvedere@ct.astro.it
Svetlana	Berdyugina	Kiepenheuer Institut fuer Sonnenphysik, GERMANY	sveta@kis.uni-freiburg.de
Andrey	Beresnyak	University of Wisconsin-Madison, USA	andrey@astro.wisc.edu
Lapo	Bettarini	Centre for Plasma Astrophysics, BELGIUM	Lapo.Bettarini@wis.kuleuver
Matteo	Bocchi	Imperial College London, UK	m.bocchi@imperial.ac.uk
Alfio	Bonanno	INAF-Osservatorio Astrofisico di Catania, ITALY	abonanno@oact.inaf.it
Axel	Brandenburg	NORDITA, Sweden	brandenb@nordita.org
Philippa	Browning	Jodrell Bank Centre for Astrophysics, Univ. of Manchester, UK	p.browning@manchester.ac
Joerg	Buechner	Max-Planck-Institut fuer Sonnensystemforschung, GERMANY	buechner@mps.mpg.de
Carlo	Burigana	INAF-IASF Bologna, ITALY	burigana@iasfbo.inaf.it
Blakesley	Burkhart	University of Wisconsin Madison, USA	burkhart@astro.wisc.edu



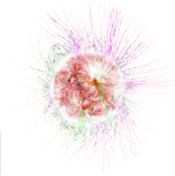
IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

Jörg	Büchner	Max-Planck-Institut für Sonnensystemforschung, GERMANY	buechner@mps.mpg.de
Simon	Candelaresi	NORDITA, SWEDEN	iomsn@physto.se
Vincenzo	Capparelli	Dipartimento di Fisica UNICAL, ITALY	vincenzocapparelli@hotmail
Monica	Cardaci	UAM & FCAGLP, SPAIN	monica.cardaci@uam.es
Giuseppe	Castro	Laboratorio Nazionale del Sud, ITALY	giuseppe.castro@lns.infn.it
Stirling	Colgate	Los Alamos Nat. Lab. USA	colgate@lanl.gov
Enrico	Corsaro	Universita' di Catania, ITALY	eco@oact.inaf.it
Neil	Cramer	University of Sidney, AUSTRALIA	cramer@physics.usyd.edu.a
Claudio	Cremaschini	SISSA, ITALY	cremasch@sissa.it
Serena	Dalena	Università della Calabria, ITALY	serena.dalena@fis.unical.it
Gustavo Rocha	da Silva	Departamento de Astronomia - IAG/USP, BRAZIL	gustavords@astro.iag.usp.b
Garcia	De Andrade	University of Rio de Janeiro, BRAZIL	garciluiz@gmail.com
Elisabete	de Gouveia Dal Pino	Univer. de Sao Paulo - Inst. de Ast, Geof. e Cien. Atmo., BRAZIL	dalpino@astro.iag.usp.br
Reinaldo Santos	de Lima	Departamento de Astronomia - IAG/USP, BRAZIL	rlima@astro.iag.usp.br
Fabio	Del Sordo	NORDITA, SWEDEN	fadiesis@gmail.com
Suzan	Doğan	University of Ege, TURKEY	suzan.dogan@mail.ege.edu



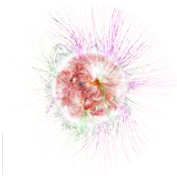
IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

Sandro	Donato	UNICAL University of Calabria, ITALY	kisspc@libero.it
James	Drake	University of Maryland, USA	drake@umd.edu
Anna	Dubinova	Institute of Applied Physics RAS, Nizhny Novgorod, RUSSIA	anndub@gmail.com
Vincent	Duez	Argelander-Institut fuer Astronomie Bonn, GERMANY	vduez@astro.uni-bonn.de
Sergey	Dyadechkin	FMI, Helsinki, FINLAND	egopost@gmail.com
Natalia	Dzyurkevich	Max-Planck Institute for Astronomy, GERMANY	natalia@mpia.de
Rasha	Emara	German University in Cairo, EGYPT	rasha.emara@guc.edu.eg
Adnan	Erkurt	Istanbul Univer., Depart. of Astr. and Space Sciences, TURKEY	adnan.erkurt@ogr.iu.edu.tr
Luigina	Feretti	Inaf-IRA Bologna ITALY	lferetti@ira.inaf.it
Attilio	Ferrari	Universita' di Torino, ITALY	ferrari@ph.unito.it
Markus	Flaig	Inst. for Computational Physics, Univer. of Tuebingen, GERMANY	flaig@tat.physik.uni-tuebinge
Gregory	Fleishman	New Jersey Institute of Technology, USA	gfleishm@njit.edu
Kotaro	Fujisawa	The University of Tokyo, JAPAN	fujisawa@ea.c.u-tokyo.ac.jp
Nadia	Gambino	I.N.F.N. Laboratori Nazionali del Sud, ITALY	nadiagambino@lns.infn.it
Santo	Gammino	I.N.F.N. Laboratori Nazionali del Sud, ITALY	gammino@lns.infn.it



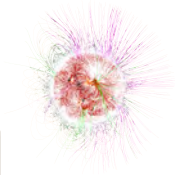
IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

Urs	Ganse	Lehrstuhl fuer Astronomie, Universitaet Wuerzburg, GERMANY	uganse@astro.uni-wuerzbur
Ilknur	Gezer	Natural and applied science, TURKEY	gezer.ilknur@gmail.com
Janusz	Gil	Kepler Institute of Astronomy, Zielonaga Gora, POLAND	jag@astro.ia.uz.zgora.pl
Noemie	Globus	Observatoire de Paris, FRANCE	noemie.globus@obspm.fr
Daniel Osvaldo	Gomez	Department of Physics, University of Buenos Aires, ARGENTINA	gomez@iafe.uba.ar
Antonella	Greco	Dipartimento di Fisica - Universita' della Calabria, Italy	greco@fis.unical.it
Oliver	Gressel	Queen Mary, University of London, UK	o.gressel@qmul.ac.uk
Salvatore	Guglielmino	Instituto de Astrofisica de Canarias, SPAIN	sgu@iac.es
Filippo	Guarnieri	University of Rome La Sapienza, ITALY	guarnieri.filippo@gmail.com
Guillermo	Hagele	FCAGLP & UAM, ARGENTINA	guille.hagele@uam.es
Gerhard	Haerendel	Max Planck Institute for Extraterrestrial Physics, GERMANY	hae@mpe.mpg.de
Michał	Hanasz	Centre for Astr., Nicolaus Copernicus Univer., Toruń, POLAND	mhanasz@astri.uni.torun.pl
Troels	Haugboelle	Niels Bohr Institute, DENMARK	haugboel@nbi.dk
Mariko	Hirai	University of Tokyo, JAPAN	hirai@eps.s.u-tokyo.ac.jp



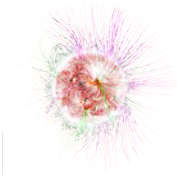
IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

Subhon	Ibadov	Institute of Astrophysics, Tajik Academy of Sciences , TAJIKISTAN	ibadovsu@yandex.ru
Stavro	Ivanovski	Universita' di Catania, ITALY	stavro.ivanovski@gmail.com
Axel	Jessner	Max-Planck-Institute for Radio Astronomy, GERMANY	jessner@mpifr-bonn.mpg.de
Hantao	Ji	Princeton University, USA	hji@pppl.gov
Anders	Johansen	Lund Observatory, SWEDEN	anders@astro.lu.se
Marian	Karlicky	Astronomical Institute, Ondrejov Observatory, CZECK REP.	karlicky@asu.cas.cz
Subhash Chandra	Kaushik	School of Studies in Physics, Jiwaji University, INDIA	subash_kaushik@rediffmail.
Koen	Kemel	NORDITA, SWEDEN	koen@nordita.org
Rony	Keppens	Centre for Plasma Astrophysics, K.U.Leuven, BELGIUM	Rony.Keppens@wis.kuleuve
Irina	Kitiashvili	Stanford University, USA	irinasun@stanford.edu
Bernhard	Kliem	University of Potsdam, GERMANY	bkliem@uni-potsdam.de
Vladimir	Kocharovsky	Inst. of Applied Phys. of the Russian Academy of Scien., RUSSIA	kochar@appl.sci-nnov.ru
Alexander	Kosovichev	Stanford University, USA	sasha@sun.stanford.edu
Manfred	Kueker	Astrophysikalisches Institut Potsdam, GERMANY	mkueker@aip.de



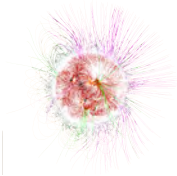
IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

Katarzyna	Kulpa-Dybel	Astronomical Observatory of the Jagiellonian University, POLAND	kulpa@oa.uj.edu.pl
Alexey	Kuznetsov	Armagh Observatory, UK	aku@arm.ac.uk
Antonino Francesco	Lanza	INAF-Osservatorio Astrofisico di Catania, ITALY	nlanza@oact.inaf.it
Alex	Lazarian	University of Wisconsin-Madison, USA	lazarian@astro.wisc.edu
Marcia Regina	Leão	Departamento de Astronomia - IAG/USP, BRAZIL	mrmleao@astro.iag.usp.br
Sergey	Lebedev	Imperial College, UK	s.lebedev@imperial.ac.uk
Martin	Lemoine	Institut d'Astrophysique de Paris, FRANCE	lemoine@iap.fr
Fabio	Lepreti	Università della Calabria, ITALY	fabio.lepreti@fis.unical.it
Paolo	Leto	INAF - Osservatorio Astrofisico di Catania, ITALY	pleto@oact.inaf.it
Harald	Lesch	University Observatory Munich , GERMANY	lesch@usm.uni-muenchen.d
Jumber	Lominadze	Abastumani National Astrophysical Observatory, GEORGIA	contact@gsa.gov.ge
Richard	Lovelace	Cornell University, USA	lovelace@astro.cornell.edu
Nazzareno	Mandolesi	INAF-IASF, ITALY	mandolesi@iasfbo.inaf.it
David	Mascali	INFN & Centro Sicil. di Fis. Nucl. e Strut. della Mat., ITALY	davidmascali@lns.infn.it
Jin	Matsumoto	Kyoto University, JAPAN	jin@kusastro.kyoto-u.ac.jp
William	Matthaeus	University of Delaware, USA	whm@udel.edu
Andrew	McMurry	CMA, University of Oslo, NORWAY	andrew.mcmurry@astro.uio.



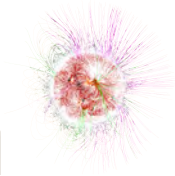
IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

Giorgi	Melikidze	Kepler Inst. of Astronomy, Univer. of Zielona Gora, POLAND	gogi@astro.ia.uz.zgora.pl
Donald	Melrose	University of Sydney, AUSTRALIA	melrose@physics.usyd.edu.
Hana	Meszarosova	Astronomical Institute Ondrejov, CZECK REP.	hana@asu.cas.cz
Natalia	Minkova	Tomsk State University, RUSSIA	nminkova@zmail.ru
Rosalba	Miracoli	INFN Laboratori Nazionali del Sud, ITALY	rosalbamiracoli@lns.infn.it
Nishant	Mittal	Meerut College, INDIA	nishantphysics@yahoo.com
Yosuke	Mizuno	UA Huntsville, USA	mizuno@cspar.uah.edu
Guillaume	Molodij	Observatoire de Meudon LESIA, FRANCE	guillaume.molodij@obspm.fr
Francesco	Musumeci	I.N.F.N. Laboratori Nazionali del Sud, ITALY	fmusumeci@dmfci.unict.it
Cristian	Napoli	Università di Catania, ITALY	chnapoli@gmail.com
Jacek	Niemiec	Institute of Nuclear Physics PAS, POLAND	Jacek.Niemiec@ifj.edu.pl
Giuseppina	Nigro	Dipartimento di Fisica UNICAL, ITALY	giusy.nigro@fis.unical.it
Aake	Nordlund	Niels Bohr Institute, DENMARK	aake@nbi.dk
Martin	Obergaulinger	Max-Planck-Institut fuer Astrophysik, GERMANY	mobergau@mpa-garching.m
Andrea	Orlando	Catania Astrophysical Observatory, ITALY	aorlando@oact.inaf.it
Viktor	Ostrovskiy	Karpov Institute of Physical Chemistry, Russia	kadyshevich@mail.ru



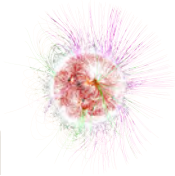
IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

Katarzyna	Otmianowska-Mazur	Astronomical Obser. Jagiellonian Univer. Krakow, POLAND	otmian@oa.uj.edu.pl
Lucio	Paterno'	Dept. Physics & Astronomy, University of Catania, ITALY	lpaterno@oact.inaf.it
Maria Elisabetta	Palumbo	INAF-Osservatorio Astrofisico di Catania, ITALY	mepalumbo@oact.inaf.it
David	Pascoe	University of St Andrews, UK	dpascoe@mcs.st-and.ac.uk
Denise	Perrone	Dipartimento di Fisica UNICAL, ITALY	denise.perrone@fis.unical.it
Martin	Pessah	Institute for Advanced Study, USA	mpessah@ias.edu
Gabriella	Piccinelli	Centro Tecnológico, FES Aragón, UNAM, MEXICO	gabriela@astroscu.unam.mx
Arakel	Petrosyan	Space Research Inst. of the Russian Academy of Scien., RUSSIA	apetrosy@rssi.ru
John	Podesta	Los Alamos National Laboratory, USA	jpodesta@solar.stanford.edu
Jens	Pomoell	University of Helsinki, FINLAND	jens.pomoell@helsinki.fi
Helen	Popova	Moscow State University, RUSSIA	popovaelp@hotmail.com
Oliver	Porth	MPIA Heidelberg, GERMANY	porth@mpia.de
Pietro	Procopio	Istituto di Astrofisica Spaziale sez. Bologna, ITALY	procopio@iasfbo.inaf.it
Tomasz	Rembiasz	Max Plank Institute for Astrophysics, Garching, GERMANY	rembiasz@mpa-garching.mp



IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

Maxim	Reshetnyak	Institute of the Physics of the Earth, RUSSIA	m.reshetnyak@gmail.com
Brian	Reville	Max-Planck-Institut fuer Kernphysik, GERMANY	brian.reville@mpi-hd.mpg.de
Ronan	Rochford	National University of Ireland, Galway	ronan.rochford@nuigalway.i
Paolo	Romano	INAF-Osservatorio Astrofisico di Catania, ITALY	prom@oact.inaf.it
Ronan	Rochford	National University Of Ireland, IRELAND	ronan.rochford@nuigalway.i
Marina	Romanova	Cornell University, USA	romanova@astro.cornell.edu
Robert	Rosner	University of Chicago, USA	r-rosner@uchicago.edu
Ilan	Roth	UC Berkeley, Space Sciences, USA	ilan@ssl.berkeley.edu
Fatima	Rubio da Costa	University of Catania, ITALY	frdc@oact.inaf.it
Guenther	Ruediger	AIP, GERMANY	gruediger@aip.de
Arto	Sandroos	Finnish Meteorological Institute, FINLAND	arto.sandroos@fmi.fi
Earl	Scime	West Virginia University, USA	escime@wvu.edu
Ildar	Shaikhislamov	Institute of Laser Physics SB RAS, RUSSIA	ildars@ngs.ru
Kazunari	Shibata	Kyoto University, JAPAN	shibata@kwasan.kyoto-u.ac
Hubert	Siejkowski	Astronomical Observatory of the Jagiellonian University, POLAND	h.siejkowski@oa.uj.edu.pl
Mario	Scuderi	Dipartimento di Fisica ed Astronomia & INFN sez. Catania, ITALY	mario.scuderi@ct.infn.it



IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

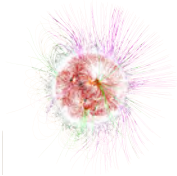
Aimilia	Smyrli	University of Catania, Italy & University of St Andrews, UK	emilia@oact.inaf.it
Felix	Spanier	Lehrstuhl für Astronomie - Uni Würzburg, GERMANY	fspanier@astro.uni-wuerzbu
Rodion	Stepanov	Institute of Continuous Media Mechanics, RUSSIA	rodion@icmm.ru
James M.	Stone	Princeton University, USA	jmstone@Princeton.EDU
Klaus G.	Strassmeier	Astrophysical Institute Potsdam, GERMANY	kstrassmeier@aip.de
Giovanni	Strazzulla	INAF-Osservatorio Astrofisico di Catania, ITALY	gstrazzulla@oact.inaf.it
Toshiki	Tajima	Ludwig-Maximilians-Universität, GERMANY	tajima.toshiki@gmail.com
Toshio	Terasawa	Institute for Cosmic Ray Research, JAPAN	terasawa@icrr.u-tokyo.ac.jp
Maurizio	Ternullo	INAF-Osservatorio Astrofisico di Catania, ITALY	mternullo@oact.inaf.it
Corrado	Trigilio	INAF-Osservatorio Astrofisico di Catania, ITALY	ctrigilio@oact.inaf.it
Enrico Maria	Trotta	Dipartimento di Fisica UNICAL, ITALY	etrotta@thematica.it
Yuriy	Tsap	Crimean Astrophysical Observatory, UKRAINE	yur@crao.crimea.ua
Salvatore	Tudisco	INFN-LNS, ITALY	tudisco@lns.infn.it
Ilkka	Tuominen	Universiy of Helsinki, FINLAND	Ilkka.Tuominen@helsinki.fi
Grazia	Umana	INAF-Osservatorio Astrofisico di Catania, ITALY	gumana@oact.inaf.it
Marek	Vandas	Astronomical Institute Ondrejov, CZECK REP.	vandas@ig.cas.cz

INAF - Osservatorio Astrofisico di Catania

Via Santa Sofia, 78 I-95123 Catania, Italy Tel.: +39- 095-7332 111 Fax: +39-095-330592

Sede "Mario G.Fracastoro" (Etna) – Tel +39-095-911580 Fax+39-095-916184

www.oact.inaf.it



IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

Antonio	Vecchio	Dipartimento di Fisica Università della Calabria, ITALY	antonio.vecchio@fis.unical.it
Loukas	Vlahos	Aristotle University of Thessaloniki, GREECE	vlahos@astro.auth.gr
Miroslava	Vukcevic	Military Academy, Belgrade University, SERBIA	vuk.mira@gmail.com
Yoern	Warnecke	NORDITA, SWEDEN	Joern@nordita.org
Christopher	Watts	University of New Mexico, USA	cwatts@ece.unm.edu
Eli	Waxman	Weizmann Institute, ISRAEL	eli.waxman@weizmann.it
Matthias	Weidinger	ITPA University of Wuerzburg, GERMANY	mweidinger@astro.uni-wuer
Maasaki	Yamada	PPPL, Princeton University, USA	myamada@pppl.gov
Huirong	Yan	Kavli Institute of Astronomy and Astrophysics-PKU, CHINA	hryan@pku.edu.cn
Leonid	Yasnov	St.Petersburg State University , RUSSIA	Yasnov@pobox.spbu.ru
Shinichiro	Yoshida	University of Tokyo, JAPAN	yoshida@ea.c.u-tokyo.ac.jp
Valentina	Zharkova	University of Bradford, UK	v.v.zharkova@brad.ac.uk
Francesca	Zuccarello	Department of Physics and Astronomy, ITALY	fzu@oact.inaf.it

IAU Symposium 274
ADVANCES IN PLASMA ASTROPHYSICS
6-10 Sept. 2010, Giardini Naxos, Italy

Scientific Summary:

The symposium was an important occasion to in order to discuss recent observational, theoretical and experimental efforts in understanding the basic plasma processes in the Universe, with broad synergies with many areas of astrophysics, including the origin and dynamics of magnetic fields in astrophysical systems (the dynamo problem), the origin of x-ray emitting coronas and the role of magnetic reconnection, acceleration of charged particles and cosmic rays, winds and jets from highly-evolved stars and supernova remnants, plasma radiation processes, turbulence of the magnetized plasma in astrophysical objects, in the interstellar and intergalactic media and the solar wind, quantum plasmas under extreme conditions in planetary interiors and in exotic stars, and other key problems in modern plasma astrophysics.

Scientific Content and discussion at the meeting:

More than 99% of the baryonic matter in the universe is in the plasma state, and many similar plasma phenomena occur in astrophysical systems on scales different by many orders of magnitudes. For example, magnetic fields are continuously generated by turbulent motions in planets, stars and galaxies; mass ejections and shocks are observed on the Sun, protostellar systems, gamma-ray bursts, neutron stars and black holes; impulsive magnetic energy release occurs in solar and stellar coronae, X-ray binaries and active galactic nuclei; shocks and particle acceleration exist in solar flares, supernova remnants, gamma-ray bursts, clusters of galaxies, etc. Recent multi-wavelength observations from ground and space provide a very important and timely question about plasma phenomena in the Universe. In addition, substantial progress has been made in theoretical modelling, computer simulations and laboratory experiments. Moreover,

INAF - Osservatorio Astrofisico di Catania
Via Santa Sofia, 78 I-95123 Catania, Italy Tel.: +39- 095-7332 111 Fax: +39-095-330592
Sede "Mario G.Fracastoro" (Etna) – Tel +39-095-911580 Fax+39-095-916184
www.oact.inaf.it

there has been a significant effort to incorporate the fundamental concepts of plasma physics in the interpretation of astronomical observations. The field of plasma physics, with strong impetus from fusion, laboratory and space plasma science has grown to significant maturity. In recent years, it has become increasingly clear that this mature body of knowledge is likely to have a significant impact in the eventual resolution of some of the outstanding questions in astrophysics, such as the origin and dynamics of magnetic fields in astrophysical systems ("the dynamo problem"), the mysteries of x-ray emitting coronas and the role of magnetic reconnection, the acceleration of charged particles and cosmic rays, the ejection of winds and jets from highly-evolved stars and supernova remnants, the turbulence of the magnetized plasma in the interstellar medium and the solar wind, and more generally, the problem of magnetic self-organization which is at the heart of the key question of the angular momentum transfer in astrophysical (and laboratory) plasma. The most important goal of the symposium was therefore to bring together experts from plasma physics community, MHD community, laboratory experiments community and numerical simulation experts.

In fact, plasma astrophysicists have always been a fairly small group, often distinct from the main astrophysical community, holding their own workshops and special sessions at plasma physics conferences. Despite the identification of a rich class of physical problems of mutual interest, the plasma physics and astrophysics communities remain, for the most part, quite detached, with different societies and memberships, conferences and journals. Thus, the primary goal of the this Symposium was to promote links and cooperation between these communities, to discuss the recent advances in understanding the fundamental plasma physics processes and their application to interpretation and understanding phenomena observed in astrophysical plasmas at various scales. Despite the wide range of temporal and spatial scales and conditions the basic physics of these phenomena is often very similar. Therefore, it was an unique occasion to discuss these issues together. The most important scientific outcomes of the conferences were the followings: **Study of physics of magnetic reconnection in a laboratory plasma** (M. Yamada) where for the first time was shown the occurrence of magnetic reconnection in a laboratory experiment, and **Galaxy dynamo by supernovae-driven interstellar turbulence,** where for the first time it was shown that dynamo action in galaxies can be generated by the supernovae explosion driven turbulence.

Assessment of the results and impact of the even in future direction of the field:

Undoubtedly, such discussions and exchange of ideas from different fields will lead to a better understanding of the basic mechanisms of many observational phenomena, their origin, structure and dynamics, and will guide future astrophysical observing programs, as well as theoretical and numerical modeling and laboratory experiments in plasma astrophysics.

Such interdisciplinary and cross-discipline discussions become increasingly important as they provide a unique opportunity to get a broader view of the field and new ideas about new methodologies and approaches. This aspect is particularly crucial for younger researchers because the learning curves in various sub-disciplines become steeper and steeper. For this reason, in addition to traditional review and contributed talks covering outstanding observational and theoretical problems of astrophysical plasmas planned to devote a some time to discussions at the end of each day sessions. In fact the organizers proposed to schedule sessions on the recent progress in computer simulations, laboratory experiments and observational programs from space and ground-based observatories. It is important to stress that the last day it was decided that this type of meetings should occur on yearly or biyearly base, so that it was informally announced the meeting

MAGNETIC FIELDS IN THE UNIVERSE: FROM LABORATORY AND STARS TO PRIMORDIAL STRUCTURES III (MFU III)
Poland, Tatra Mountains, August 21-27, 2011

which is intented to be a natural follow-up of the iau274 symposium.

INAF - Osservatorio Astrofisico di Catania
Via Santa Sofia, 78 I-95123 Catania, Italy Tel.: +39- 095-7332 111 Fax: +39-095-330592
Sede "Mario G.Fracastoro" (Etna) – Tel +39-095-911580 Fax+39-095-916184
www.oact.inaf.it

POST MEETING REPORT

for meetings other than Joint Discussions and Special Sessions

1. Meeting Number: IAU Symposium 275

2. Meeting Title: Jets at all Scales

3. Coordinating Division: IAU Divisions X (Radio Astronomy), XI (Space & High Energy Astrophysics).

4. Dedication of meeting (if any): Felix Mirabel 65th anniversary.

5. Location (city, country): Buenos Aires, Argentina.

6. Dates of meeting: September 13–17, 2010.

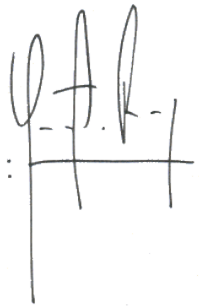
7. Number of participants: 136 participants (35 were women).

8. List of represented countries:
Argentina
Belgium
Brazil
Chile
China
Czech Republic
France
Estonia
Finland
Germany
Greece
Israel
Italy
Japan
Mexico
Poland
Romania
Russia
Spain
Taiwan
The Netherlands
Turkey
United Kingdom
United States of America

9. Report submitted by: Gustavo E. Romero (chair SOC and LOC)

10. Date and place: La Plata, January 24, 2011.

11. Signature of SOC Chairperson:



Atttached material:

i Final Scientific Program
ii List of participants
iii List of recipients of IAU Grants, including amount and country
iv Receipts signed by the recipients of IAU Grants (This is sent separately)
v Brief report (text.txt file or word.doc) to the Executive Committee on the scientific highlights of the meeting

IAU Symposium No. 275: "Jets at all Scales"

Brief report to the Executive Committee on the scientific highlights of the meeting

The IAU Symposium No. 275 on Jets at all Scales was held in Buenos Aires city, Argentina, in September 2010. Out of 187 registered participants, more than 130 from 26 countries met at the Novotel, in the traditional Calle Corrientes of Buenos Aires, to discuss the latest results on astrophysical jets and outflows.

The first ideas for this Symposium appeared at discussions among participants of the 7th Microquasar Workshop, entitled "Microquasars and Beyond", held in Foca, Izmir, Turkey, on September, 2008. The series of Microquasar Workshops had by then extended over more than a decade and started to attract participants from far beyond the relatively small community of researchers on galactic binary systems. Comparisons between the jets of microquasars and those presented by other astrophysical objects like gamma-ray bursts, active galactic nuclei, and young stellar objects were becoming more and more common in these meetings. The time seemed to have arrived for a much larger meeting that could gather outstanding researchers from all these different fields to discuss at length the similarities and differences among all types of jets, as well as the underlying physics.

The opportunity came in 2009 with the endorsement and sponsoring by IAU Commissions and Divisions and subsequent approval by the IAU Executive Committee. The final result reflects, I think, a good balance of different topics related to the production, collimation, propagation, interaction, and radiative properties of jets on all scales. Both new theoretical and observational results of high impact were presented at the Symposium, including the first detection of polarized synchrotron emission from the jet of a young stellar object (discovery published subsequently in *Science*).

The discussions, were highly motivating and constructive. Many of them occurred during extensive coffee breaks, posters sessions, and in the nearby cafés of Buenos Aires. Their effect, I am sure, will appear in many forthcoming publications and can be already appreciated in the volume edited by G.E. Romero, R. Sunyaev, and T. Belloni, now in press with CPU.

The meeting was also an occasion to celebrate Félix Mirabel's 65th birthday and pay tribute to his outstanding contributions to our current knowledge of jets. Félix has been a source of inspiration for all of us that have worked with him. His permanent action fostering high-energy astrophysics in South America deserves a particular mention.

It has past a while since the last IAU Symposium was held in Argentina. This new occasion helped to promote a research field that is growing very fast in several South American countries. It was also a good opportunity to show how strong is the female astrophysical community in Argentina: 17 out of 25 Argentinians that attended the Symposium were women (2/3 of the total number of women in the meeting). I doubt that such a rate can be matched in any other country.

Gustavo E. Romero, chair, SOC and LOC

JETS AT ALL SCALES

Buenos Aires, Argentina, September 13-17, 2010

Program

Monday 13

08:00: Registration opens

08:45 – 09.00: Welcome

09:00 – 09:45: Invited review I: The jet/accretion disk coupling (F. Mirabel)
09:45 – 10.30: Invited review II: Accreting X-ray binaries and jets (R. Sunyaev)

10:30 – 11:00: Coffee break

Morning Session: Jets: basic issues and physical processes

11:00 – 11:30: Invited talk 1: The physics of relativistic jets (J. F. Hawley)
11:30 – 11:50: Contributed talk 1: Waves in Poynting-flux dominated jets (J. G. Kirk)
11:50 – 12:10: Contributed talk 2: Modelling magnetially dominated and radiatively cooling jets (M. Huarte-Espinosa)
12:10 – 12:30: Contributed talk 3: Transformation of the electromagnetic into the plasma energy in Poynting dominated jets (Y. Lyubarski)

12:30 -15:00: Lunch break

Afternoon Session: Accretion processes and outflows

15:00 – 15:30: Invited talk 2: The stability of astrophysical jets (P. Hardee)
15:30 – 16:00: Invited talk 3: Accretion disk winds (D. Proga)
16:00 – 16:20: Contributed talk 4: Investigating the disk-jet coupling in accreting compact objects by studying the "radio quiet" sources (P. Soleri)

16:20 – 17:00: Coffee break

17:00 – 17:20: Contributed talk 5: Fitting along the Fundamental plane: New comparisons of jet physics across the black hole mass scale (S. Markoff)
17:20 – 17:40: Contributed talk 6: Jets at lowest mass accretion rates (D. Maitra)
17:40 – 18:00: Contributed talk 7: Radiatively efficient black holes in the hard state: the case of H1743-322 (M. Coriat)

19:00: Welcome cocktail

Tuesday 14

09:00 – 09:45: Invited review III: Relativistic jets at high energies (A. Levinson)

Morning Session. New observational results on jets at all scales

09:45 – 10.15: Invited talk 1: Broadband observations of jets on different scales (E. Gallo)
10:15 – 10:45: Contributed talk 1: The far-infrared view of the radio galaxy M 87 as seen by the Herschel Space Observatory (M. Baes)

10:45 – 11:15: Coffee break

11:15 – 11:35: Contributed talk 2: Unveiling the nature of extragalactic jets with Chandra observations (F. Massaro)
11:35 – 11:55: Contributed talk 3: The jet in M 87 from EVN observations (G. Giovannini)
11:55 – 12:15: Contributed talk 4: The picture of relativistic jet from Fermi-LAT and multi-band observations of blazar 3C 279 (M. Hayashida)

12:15 -15:00: Lunch break

Afternoon Session: Galactic jets (Galactic center)

15:00 – 15:30: Invited talk 3: The Galactic Center jet (H. Falcke)
15:30 – 16:00: Invited talk 4: A magnetohydrodynamical model for the formation of episodic jets (F. Yuan)
16:00 – 16:20: Contributed talk 5: High luminosty jets: Can the GRS 1915+105 plateau be compared to the canonical hard state? (P. Van Oers)

16:20 – 17:00: Coffee break

17:00 – 17:20: Contributed talk 6: The disk/jet connection in the enigmatic microquasar Cygnus X-3 (K. Koljonen)
17:20 – 17:40: Contributed talk 7: The role of jets in black-hole X-ray binaries (N. Kylafis)
17:40 – 18:00: Contributed talk 8: The physics of disk winds, jets, and X-ray variability in GRS 1915+105 (J. Neilsen)

Parallel Educational Program I (in Spanish)

19:30: A.J. Castro-Tirado "GRBs, los fenómenos más energéticos del Universo, y su estudio con instrumentación robótica" (at the Planetarium of the City of Buenos Aires

Wednesday 15

09:00 – 09:45: Invited review IV: Jets from microquasars (S. Corbel)

Morning Session. I Microquasars

09:45 – 10.15: Invited talk 1: Non-thermal processes in microquasars (V. Bosch-Ramon)
10:15 – 10:45: Invited talk 2: Investigating accretion disk - radio jet coupling across the stellar mass scale (J. Miller-Jones)

10:45 – 11:15: Coffee break

11:15 – 11:35: Contributed talk 1: X-ray radiation of the jets and the supercritical accretion disk in SS 433 (S. Fabrika)
11:35 – 11:55: Invited talk 3: Relativistic jets from accreting neutron stars and black holes: similarities and differences (S. Migliari)
11:55 – 12:25: Contributed talk 2: Long-term simulations of extragalactic jets: cavities and feedback (M. Perucho-Pla)
12:25 – 12:45: Contributed talk 3: GRS 1915+105 celebrates its majority (1992-2010) (A. Castro-Tirado)

12:45 -15:00: Lunch break

Free Afternoon for Social Activities

Parallel Educational Program II (in Spanish)

19:30: I.F. Mirabel "Agujeros negros y los albores del Universo" (at the Planetarium of the City of Buenos Aires)

Thursday 16

09:00 – 09:45: Invited review V: The formation of relativistic jets (D. Meier)

Morning Session. Jet formation mechanisms

09:45– 10:15: Invited talk 1: General relativistic MHD around rotating black holes (S. Koide)
10:15– 10:35: Contributed talk 1: Brown dwarfs jets: testing the universality of jet launching mechanisms at the lowest masses (E. Whelan)

10:35 – 11:15: Coffee break

11:15 – 11:45: Invited talk 2: Suzaku studies of microquasars (Y. Ueda)
11:45 – 12.05: Contributed talk 2: Particle acceleration and heating by magnetic reconnection in accretion disk / jet systems: Numerical simulations (E. M. Gouveia Dal Pino)
12:05 – 12:25: Contributed talk 3: Connections between jet formation and multiwavelenght spectral evolution in black hole transients (E. Kalemci)
12:25 – 12:45: Contributed talk 4: Jet launching and field advection in disks (J. Ferreira)

12:45 -15:00: Lunch break

Afternoon Session: Jets from protostars

15:00 – 15:30: Invited talk 2: Radio observations of jets from massive stars (L.F. Rodríguez)
15:30 – 16:00: Invited talk 3: Jet-driven molecular outflows (S. Cabrit)
16:30– 17:00: Invited talk 4: Formation of protostellar jets (C. Fendt)

17:00 – 17:30: Coffee break

17:30 – 17:50: Contributed talk 6: On the three-dimensional structure of HH jets (F. De Colle)
17:50 – 18:10: Contributed talk 7: Origin of jets from young stars: high-angular resolution observations (C. Dougados)

Conference Dinner

20:00 h: Conference Banquet with Tango Show (voucher required).

Friday 17

09:00 – 09:45: Invited review VI: Relativistic jets and Fermi observations (C.D. Dermer)

Morning Session. I AGN's Jets

09:45 – 10.15: Invited talk 1: Hadronic jet models today (M. Sikora)
10:15 – 10:35: Contributed talk 1: Radiation from matter entrainment in astrophysical jets (A. Araudo)

10:35 – 11:15: Coffee break

11:15 – 11:35: Contributed talk 1: Variability studies in blazar jets with SF analysis: caveats and problems (D. Emmanoulopoulos)
11:35 – 11:55: Contributed talk 3: Jet-disk connection in OJ 287 (M. J. Valtonen)
11:55 – 12:15: Contributed talk 4: Time-dependent multi-zone radiation transfer modeling of fast blazar variability (G. Fossati)
12:15 – 12:35: Contributed talk 5: The influence of collimation on the appearance of relativistic jets (P.O. Petrucci)

12:35 -15:00: Lunch break

Afternoon Session: GRB's jets

15:00 – 15:30: Invited talk 2: GRBs: Recent theoretical progress (T. Piran)
15:30 – 16:00: Invited talk 3: GRBs: Phenomenology (G. Ghisellini)
16:00 – 16:20: Contributed talk 6: Afterglow light curves from magnetized GRB flows (P. Mimica)

16:20 – 17:00: Coffee break

17:00 – 17:20: Contributed talk 7: GRB spectral-energy correlations: facts and misconceptions (G. Ghirlanda)
17:20 – 17:40: Contributed talk 8: Instabilities in the GRB central engine. What makes the jet variable? (A. Janiuk)
17:40 – 18:00: Contributed talk 9: Simulation of relativistic shocks and associated radiation from turbulent magnetic fields (K –I. Nishikawa)

18:00 – 18:30: Summary (Sambruna / Paredes / Romero)

18:30: Farewell

Editors for the Proceedings

Gustavo E. Romero (Chief Editor)

Instituto Argentino de Radioastronomía (IAR)
C.C. No.5
1894 Villa Elisa
Buenos Aires
Argentina
romero@fcaglp.unlp.edu.ar

Co-Editors:

Rashid Sunyaev

Max-Planck-Institut für Astrophysik
Karl-Schwarzschild-Str. 1
D-85748 Garching
Germany
sunyaev@mpa-garching.mpg.de

Tomaso Belloni

INAF
Osservatorio Astronomico di Brera
Via E Bianchi 46
IT 23807 Merate (LC)
Italy
belloni@merate.mi.astro.it

List of participants – **IAU Symposium 275, "Jets at all scales"**

Andruchow, Ileana
Araudo Anabella T.
Asada Keiichi
Baes, Maarten
Battich, Tiara
Bednarek, Wlodek
Benaglia, Paula
Bosch-Ramon, Valenti
Bromberg, Omer
Calcaferro, Leila Magdalena
Caproni, Anderson
Castro-Tirado, Alberto J
Cellone, Sergio
Celotti, Anna Lisa
Chen, Tao
Chun, Yoon Young
Cimo, Giuseppe
Combi, Jorge Ariel
Cora, Sofia Alejandra
Corbel, Stephane
Coriat, Mickael
Correa, Camila Anahi
Cseh, David
Dauser, Thomas
De Colle, Fabio
de Gouveia Dal Pino, Elisabete
del Valle Maria V.
Dermer, Charles
Dibi Salome
Drappeau Samia
Dubois, Richard
Eikenberry, Stephen
Emmanoulopoulos, Dimitrios
Fabrika, Sergei
Falceta-Goncalves, Diego
Falcke, Heino
Fendt, Christian
Ferreira Jonathan
Foschini, Luigi
Fossati, Giovanni
Fromm Christian
Gallo, Elena
García Federico
Gear, Walter
Ghirlanda, Giancarlo
Ghisellini, Gabriele
Giovannini Gabriele
Gizani Nectaria
Gomez, Yolanda
Guillard, Pierre

Hardee, Philip
Hawley, John
Hayashida, Masaaki
Huarte Espinosa, Martin
Isobe, Naoki
Janiuk, Agnieszka
Jiraskova, Sarka
Kalemci, Emrah
Kawai, Nobuyuki
Kirk, John
Koide, Shinji
Koljonen, Karri
Krasnopolsky, Ruben
Kundt Wolfgang
Kunert-Bajraszeska, Magdalena
Kylafis, Nick
Labiano, Alvaro
Larchenkova Tatiana
Leedjärv, Laurits
Levinson Amir
Lopez-Camara Ramirez, Diego
Luna, Homero
Lutovinov Alexander
Lyubarsky, Yuri
Maitra, Dipankar
Malzac, Julien
Markoff, Sera
Massaro Francesco
Meier, David
Meszaros, Attila
Michaut, Claire
Migliari Simone
Miller-Jones, James
Mimica, Petar
Mirabel, Felix
Morales Texeira Danilo
Nazarova Ludmila
Nielsen, Joseph
Nishikawa, Ken-Ichi
Orellana Mariana
Paragi, Zsolt
Paredes, Josep M.
Pe'er, Asaf
Pellizza, Leonardo J.
Pepe, Carolina
Pérez, Daniela
Peri, Cintia
Perucho-Pla, Manel
Petrucci Pierre-Olivier
Piran, Tsvi
Plotkin Richard
Polko Peter

Prieto, Almudena
Proga Daniel
Quirrenbach, Andreas
Rahoui, Farid
Reyes, Luis
Reynoso, Matias
Riffel Rogemar
Rodriguez, Luis
Romero, Gustavo E.
Russell, David
Sambruna, Rita
Sanchez-Fernandez, Celia
Schinzel Frank
Seta, Hiromi
Shahbaz, Tariq
Sikora, Marek
Soleri, Paolo
Sosa, Marina Soledad
Suárez, Alejandra E.
Tesileanu, Ovidiu
Tombesi, Francesco
Tovmassian Gagik
Tudose, Valeriu
Ueda, Yoshihiro
Valtonen, Mauri
van Oers Pieter
Vicente, Silvia
Vieyro, Florencia
Vila Gabriela S.
Whelan, Emma
Yuan, Feng
Zibecchi, Lorena
Ziolkowski, Janusz
Zurita Heras, Juan Antonio

International Astronomical Union
Union Astronomique Internationale

POST MEETING REPORT FORM

for meetings other than Joint Discussions and Special Sessions

Deadline for Submission: within 1 month after the meeting

the following information should be sent to the IAU Assistant General Secretary

The following documents should be attached:

i Final Scientific Program

ii List of participants

iii List of recipients of IAU Grants, including amount and country

iv Receipts signed by the recipients of IAU Grants (This does not apply to Scientific Meetings held during General Assemblies)

v Brief report (text.txt file or word.doc) to the Executive Committee on the scientific highlights of the meeting (1-2 pages)

1. Meeting Number: 276

2. Meeting Title: The Astrophysics of Planetary Systems
Formation, Structure, and Dynamical Evolution

3. Coordinating Division: Division III Planetary Systems Sciences

4. Dedication of meeting (if any): -

5. Location (city, country): Torino - Italy

6. Dates of meeting: October 10-15, 2010

7. Number of participants: 218

8. List of represented countries: Canada; USA; Argentina; Brazil; China; Japan; Israel; Taiwan; Austria; Belgium; Denmark; France; Germany; Greece; Hungary; The Netherlands; Poland; Portugal; Russia; Sweden; Spain; Switzerland; UK; Ukraine; Vatican City; Australia; Italy

9. Report submitted by: Alessandro Sozzetti, SOC Chair

10. Date and place: November 15, 2010 - Torino, Italy

11. Signature of SOC Chairperson: 

Scientific Summary
IAU Symposium 276
The Astrophysics of Planetary Systems: Formation, Structure, and Dynamical Evolution
10 – 15 October, 2010, Torino, Italy

More than 500 planets are now known to orbit main-sequence stars in the neighbourhood of our Sun, discovered and characterized using a variety of techniques, both from the ground and in space. On the one hand, the observational data on extrasolar planets show striking properties indeed, likely evidence of the complexity of the process of planet formation and evolution. On the other hand, the large flow of empirical information gathered on extrasolar planets in the Solar neighbourhood is such that in-depth studies are now possible, which allow us to reach a deeper understanding of the mechanisms regulating their formation processes, their internal structure and atmospheres, and their long-term dynamical evolution. Next-generation observatories (both from the ground and in space) and new methods of data analysis have reached a degree of ripeness that the discovery of planets similar to our Earth, for which it might be possible to establish the degree of habitability, appears to be behind the corner. Fifteen years after the first announcement of a Jupiter-mass companion orbiting a normal star other than the Sun, the formation and evolution of planetary systems is now emerging as a new, quickly expanding interdisciplinary research field.

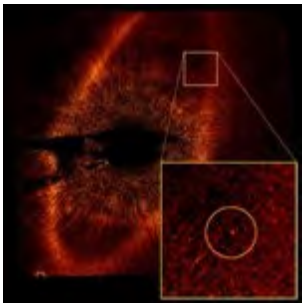
When the vast breadth of exoplanets research is taken as a whole, one then realizes how we're now witnessing the beginning of a new era of comparative planetology, in which our Solar System can finally be put in the broader context of the astrophysics of planetary systems. To this end, help from future data obtained with a variety of techniques will prove invaluable. Planet search surveys, initially focused solely on planet discovery, are now being designed to put the emerging properties of planetary systems on firm statistical grounds and thus thoroughly test the theoretical explanations put forth to explain their existence. Furthermore, both NASA and ESA are now formulating strategies to establish a logical sequence of missions and telescope construction to optimize the pace of exoplanet discoveries (with both direct and indirect techniques) and address key questions on the physical characterization and architecture of planetary systems.

The 276th IAU Symposium, held in Torino, Italy, during the week of October 10-15, 2010, focused on addressing two main questions: Where do we stand? What's next? At the time of definition of the final scientific program, the broad range of issues in the astrophysics of planetary systems selected to provide answers to these questions was divided into four main topical sessions: *Planet Formation, Internal Structure and Atmospheres, Interactions,* and *The Next Decade*. The first three sessions allowed for vibrant confrontations between theory and observations. Datasets of the highest quality, state-of-the-art numerical tools, and increasingly sophisticated theoretical models showed the impressive progress being made in our understanding of planet formation and evolution. The last session provided a forward look into strategic planning exercises of both community and agencies and into ongoing preparations and developments of future ground-based and space-borne observatories devoted to exoplanetary sciences.
One major objective achieved during the Symposium was indeed that of connecting scientific results obtained by ground-based and space-borne research programs for the detection and characterization of extrasolar planets with the grand projects that will contribute to move forward the frontier of research in the field during the next decade. The most recent, exciting discoveries of transiting rocky planets ('Super Earths') by the Kepler and CoRoT space telescopes were discussed in parallel to unprecedented results obtained with large ground-based facilities, such as the VLT and the Keck Observatories, regarding the characterization of the chemical composition of the atmospheres of nearby exoplanets. From the ground, ambitious project to search for Earth analogs

around the nearest stars with the HARPS spectrograph were discussed in the context of the science potential of next generation instruments that will come online during the next decade, such as ESPRESSO on the VLT, or CODEX on the 42-m E-ELT. From space, the heritage of the great results obtained by the Hubble and Spitzer space telescopes (at visible and infrared wavelengths) on the characterization of the structural and atmospheric properties of extrasolar gas giants was shown to form the basis for the design of new challenging exoplanet characterization programs with the next generation of space observatories, such NASA's JWST and ESA's Gaia.

The community answered even more enthusiastically than we could hope for. The great interest in the Symposium can be easily quantified in terms of its sheer numbers: 12 invited review, 27 invited talks, 39 oral contributions, and some 120 posters, whose authors had the opportunity to illustrate with 1-minute presentations within five dedicated daily poster popups sessions. Overall, the Symposium entertained 218 astronomers from 27 countries. The enthusiasm and professionalism of the participants crucially helped in making IAUS 276 an overwhelming success.

Oral Poster



Oral Program

IAU Symposium 276

the Astrophysics of Planetary Systems: Formation, Structure, and Dynamical Evolution

Torino - Italy, 11-15 October 2010

FINAL PROGRAM

IR: invited Review • I: invited Talk • C: Contributed Talk

Sunday 10th October:	
17:00 - 21:00:	REGISTRATION OPEN
18:00 - 21:00:	WELCOME RECEPTION
Monday 11th October:	
PLANET FORMATION 1	
08:00:	REGISTRATION OPEN
Chair:	**A. SOZZETTI**
09:00 - 09:20:	Welcome address from the Mayor of Torino, SOC and LOC
09:20 - 09:55:	(IR) **G. Marcy** - the Occurrence and Mass Distribution of Close-in Planets of 3 - 1000 M_{Earth}
09:55 - 10:30:	(IR) **F. Pepe** - Hunting for the Lowest-Mass Exoplanets
10:30 - 10:45:	(C) **E. Delgado Mena** - Chemical clues on the formation of planetary systems: C/O vs Mg/Si for HARPS GTO sample
10:45 - 11:00:	(C) **S. Vauclair** - Precise Characterisation of Exoplanet-host Stars Parameters in connexion with the Formation and Evolution of

	Planetary Systems
11:00 - 11:30:	COFFEE BREAK
Chair:	G. MARCY
11:30 - 12:05:	(IR) **W.J. Borucki** - *Kepler*. NASA's First Mission capable of finding Earth-size Planets in the Habitable Zone
12:05 - 12:30:	(I) **M. Deleuil** - CoRoT Mission Highlights
12:30 - 12:45:	(C) **J. Cabrera** - On the Yield of Detections in the CoRoT Exoplanet Survey
12:45 - 13:00:	(C) **T. Mazeh** - Detection of the Ellipsoidal and the Relativistic Beaming Effects of CoRoT-3
13:00 - 14:45:	LUNCH BREAK

PLANET FORMATION 2

Chair:	Y. ALIBERT
14:45 - 15:00:	(C) **Z. Regaly** - A High-Resolution Spectroscopic View of Planet Formation Sites
15:00 - 15:25:	(I) **A. Moro-Martín** - Characterizing Planetesimal Belts through the Study of Debris Dust
15:25 - 15:40:	(C) **C. Eiroa** - Debris Disc Studies with Hershel/DUNES. Discovery of a new class of faint, cool discs
15:40 - 15:55:	(C) **A.-M. Lagrange** - The Candidate Companion Around b Pictoris
15:55 - 16:25:	COFFEE BREAK
Chair:	A. BOSS
16:25 - 17:00:	(IR) **S. Ida** - Theoretical Predictions of *M, a & e*-Distributions of Jupiters/Super-Earths
17:00 - 17:15:	(C) **C. Mordasini** - Planet Formation and Evolution: Masses, Distances, Luminosities and Radii
17:15 - 17:40:	(I) **W. Benz** - The formation of the critical cores of giant planets
17:40 - 17:55:	(C) **G. Wuchterl** - Planet Masses and Radii from Physical Principles
17:55 - 18:20:	POSTER POPUPS I

21:00:	PUBLIC LECTURE - **D. Charbonneau - How to find and Inhabited Planet: the Last Generation of Lonely Astronomers** - Teatro Gobetti downtown Torino

Tuesday 12th October:

PLANET FORMATION 3

Chair: W. KLEY

09:00 - 09:35:	(IR) **S. Raymond** - Forming Super-Earths and Terrestrial Planets
09:35 - 10:00:	(I) **A. Johansen** - The Clumping Scenario for Planetesimal Formation
10:00 - 10:25:	(I) **R. Helled** - Massive Gaseous Protoplanets in the Disk instability Model
10:25 - 10:40:	(C) **S. Nayakshin** - Tidal Downsizing Hypothesis for planet formation
10:40 - 11:35:	COFFEE BREAK

Chair: M.G. LATTANZI

11:35 - 12:00:	(I) **A. Nordlund** - Planet Formation: Formation of Brown Dwarfs and Massive Planets
12:00 - 12:15:	(C) **R. Jayawardhana** - Direct Imaging and Spectroscopy of Planets and Brown Dwarfs in Wide Orbits
12:15 - 12:30:	(C) **J. Sahlmann** - New Results on the Dividing Line Between Massive Planets and Brown Dwarfs
12:30 - 12:45:	(C) **R. Klement** - The Visitor from an Ancient Galaxy. A planetary companion around an old, metal-poor Red Horizontal Branch star
12:45 - 14:15:	LUNCH BREAK

STRUCTURE and ATMOSPHERES 1

Chair: D. LATHAM

14:15 - 14:50:	(IR) **D. Charbonneau** - Ten Years and One Hundred Transiting Planets
14:50 - 15:15	(I) **A. Collier Cameron** - Statistical Patterns in Ground-Based Transit Surveys

15:15 - 15:30:	(C) **D. Queloz** - CoRoT-7b and the Limitation of the Radial-Velocity Follow-Up on Transiting Planets
15:30 - 15:50:	(I) **A.J. Burgasser** - The Spectra of Low-Temperature Atmospheres: Lessons Learned from Brown Dwarfs
15:50 - 16:05:	(C) **F. Faedi** - New Discoveries from SuperWASP-North
16:05 - 16:35:	COFFEE BREAK
Chair: T. MAZEH	
16:35 - 17:00:	(I) **M. Swain (*)** - The Power of the Secondary Eclipse: a focus on spectroscopy
17:00 - 17:35:	(IR) **G. Tinetti** - Transiting Exoplanets: Atmospheric Chemistry
17:35 - 17:50:	(C) **B. Croll** - Groundbased Near-infrared Thermal Emission from the hottest of the hot Jupiters
17:50 - 18:05:	(C) **A.M. Mandell** - A NIR Spectrum of a "Hot Jupiter" from the Ground: Preliminary Results
18:05 - 18:20:	(C) **L. Fossati** - A Multi-Wavelength Analysis of the Wasp-12 Planetary System
18:20 - 18:35:	(C) **M. Gillon** - The HARPS-*Spitzer* Transit Search: First Results
18:30 - 19:00:	**POSTER POPUPS II**

(*) directly connected in interactive video communication with his PC at home in Pasadena, California, by using the software *easymeeting*™ (developed by Feedback Italia)

Wednesday 13th October:

STRUCTURE and ATMOSPHERES 2

Chair: W. BORUCKI	
09:00 - 09:35:	(IR) **G. Chabrier** - The Internal Structure and Evolution of Giant Exoplanets: theory under Test
09:35 - 10:00:	(I) **D. Valencia** - Structural Properties of Super-Earths (& mini-Neptunes)
10:00 - 10:15:	(C) **L.A. Rogers** - GJ 1214b and the Prospects for Liquid Water on Super Earths
10:15 - 10:30:	(C) **F.W. Wagner** - Physical State of the Deep Interior of CoRoT-7b

10:30 - 10:55:	POSTER POPUPS III
10:55 - 11:25:	COFFEE BREAK
Chair:	D. QUELOZ
11:25 - 12:00:	(IR) S. Seager - Exoplanet Atmosphere: a Theoretical Outlook
12:00 - 12:15	(C) I. Snellen - Orbital motion, absolute mass & high-altitude winds of hot HD209458 b
12:15 - 12:40:	(I) E. Miller-Ricci Kempton - The Properties of Super-Earth Atmospheres
12:40 - 14:35:	LUNCH BREAK

INTERACTIONS 1

Chair:	D. CHARBONNEAU
14:35 - 14:50:	(C) T. Guillot - On the Radiative Equilibrium of Irradiated Planetary Atmospheres
14:50 - 15:15:	(I) E.B. Ford - Diverse Origin of Exoplanets' Eccentricities & Inclinations
15:15 - 15:30:	(C) S. Chatterjee - Dynamical Formation of *High-Inclination*, and *Long Period* and *Moderate-Eccentricity* Orbits
15:30 - 15:55:	(I) M.J. Holman - Dynamics and constraints from the transit timing variations of Kepler planets
15:55 - 16:25:	COFFEE BREAK
Chair:	S. UDRY
16:25 - 17:00:	(IR) J. Winn - The Rossiter-McLaughlin Effect for Exoplanets
17:00 - 17:25:	(I) R. Mardling - Tides and Dynamics: an Exoplanets Treasure Trove
17:25 - 17:40:	(C) N. Husnoo - Tidal circularisation. A new look at the eccentricities of Hot Jupiters
17:40 - 17:55:	(C) J. Leconte - Is Tidal Heating Sufficient to Explain "bloated" Hot Jupiters ?
17:55 - 18:20:	(I) D. Fabrycky - Tidal Dynamics of Transiting Exoplanets

18:20 - 18:35:	(C) **A. Triaud** - Spin-Orbit Angles: a Probe to FEvolution
19:30:	VISIT TO PALAZZO MADAMA + APERITIF
21:00	SYMPOSIUM DINNER AT PALAZZO MADAMA

Thursday 14th October:

inTERACTIONS 2

Chair: S. SEAGER

09:00 - 09:15:	(C) **S. Naoz** - The Origin of retrograde Hot Jupiters
09:15 - 09:30:	(C) **D. Brown** - Are falling planets spinning up their host stars ?
09:30 - 10:05:	(IR) **W. Kley** - Orbital Migration models under Test
10:05 - 10:30:	(I) **P. Kalas** - Direct Imaging of Massive Extrasolar Planets
10:30 - 10:55:	(I) **A. Correia** - Spin-Orbit Resonances: our Solar System in Context
10:55 - 11:25:	COFFEE BREAK

Chair: T. GUILLOT

11:15 - 11:45:	(C) **D. Lai** - Spin-Orbit Misalignment in Planetary Systems and Magnetic Star-Disk Interaction
11:50 - 12:05:	(C) **A. Mustill** - Hamiltonian model of capture into mean motion resonance
12:05 - 12:20:	(C) **M.B. Davies** - Turning Solar Systems into Extrasolar Planetary Systems
12:20 - 12:45:	**POSTER POPUPS IV**
12:45 - 14:00:	LUNCH BREAK
14:00 - 19:00:	AFTERNOON VISIT TO VENARIA REALE ROYAL RESIDENCE

Friday 15th October:

THE NEXT DECADE: COMMUNITY/AGENCIES VIEWS

Chair: S. RAYMOND

09:00 - 09:30:	(I) **V. Coudé du Foresto** - Exoplanets: Blue Dots Report
09:30 - 10:00:	(I) **A. Hatzes** - A European Roadmap for Exoplanets. The ExoPlanet Roadmap Advisory Team (EP-RAT)
10:00 - 10:30:	(I) **A. Boss** - New Worlds, New Horizons in Astronomy and Astrophysiscs (I) **W. Traub** - Exoplanets: Astro 2010 Survey Results, ExEP Proposed Community Actions (Joint presentation with Alan Boss)
10:30 - 11:00:	(I) **D.M. Hudgins** - NASA's Approach to the Next Decade of Exoplanet Discoveries
11:00 - 11:30:	COFFEE BREAK

Chair: R. GRATTON

11:30 - 12:00:	(I) **F. Favata** - The ESA Approach to the Next Decade of Exoplanet Discoveries

the NEXT DECADE: BIG PROJECTS IN THE MAKING

12:00 - 12:30:	(I) **O. Lagage ® M. Clampin** - The James Webb Space Telescope and the Exoplanets
12:30 - 13:00:	(I) **R. Gilmozzi** - Ground-Based Characterization of Exoplanets: the Era of the ELTs
13:00 - 14:30	LUNCH BREAK

Chair: W. TRAUB

14:30 - 14:45:	**POSTER POPUPS V**
14:45 - 15:00:	(C) **D. Latham** - The Future of Precise Radial Velocities and the Impact of Astro2010
15:00 - 15:15:	(C) **R. Gratton** - Science with EPICS. The E-ELT Planet Finder
15:15 - 15:35:	(C) **D. Bennett & J.-P. Beaulieu** - Towards Habitable Earth with WFIRST and EUCLID

15:35 - 15:50:	(C) **H. Rauer** - PLAnetary Transit and Oscillations of stars
15:50 - 16:05:	(C) **D. Busonero** - The Gaia Astrometric Survey for Exoplanets in the Solar Neighborhood
16:05 - 16:30	COFFEE BREAK

HABITABILITY & BIOSIGNATURES

Chair: A. SOZZETTI

16:30 - 16:55:	(I) **L. Kaltenegger** - Biomarkers in terrestrial planets atmospheres. Super-Earths & Life: a fascinating cross-disciplinary puzzle
16:55 - 17:20:	(I) **F. Selsis** - Terrestrial Exoplanets: Diversity, Habitability and Characterization
17:20 - 17:35:	(C) **E. Palle** - Observations and Modeling of Earth's Transmission Spectrum through Lunar Eclipses: a Window to Transiting Exoplanet Characterization
17:35 - 17:50:	(C) **J.L. Grenfell** - Biomarkers in Super Earth Atmospheres: Photochemical Responses
17:50 - 18:30:	CONFERENCE SUMMARY - **D. Latham**

18:30:	END of SYMPOSIUM

24/01/2011

IAUS 276 – PARTICIPANTS

	First Name	Last Name	Institute	Country	e-mail
1	Ummi	**Abbas**	INAF - Astronomical Observatory of Torino	Italy	abbas@oato.inaf.it
2	Yann	**Alibert**	University of Bern	Switzerland	alibert@space.unibe.ch
3	Roi	**Alonso**	Geneva Observatory	Switzerland	roi.alonso@unige.ch
4	Leonardo	**Andrade de Almeida**	National Institute for Space Research	Brazil	leonardo@das.inpe.br
5	Daniel	**Angerhausen**	German SOFIA Institute	Germany	daniel.angerhausen@gmail.com
6	Alberto	**Anselmi**	Thales Alenia Space SpA, Torino	Italy	Alberto.Anselmi@thalesaleniaspace.com
7	Serena	**Arena**	CRAL/ENS Lyon	France	serena.arena@ens-lyon.fr
8	Paola	**Ballerini**	INAF - Astronomical Observatory of Catania	Italy	pballerini@astropa.unipa.it
9	Mauro	**Barbieri**	INAF - Astronomical Observatory of Padova	Italy	mauro.barbieri@oapd.inaf.it
10	Richard K.	**Barry**	NASA-GSFC, Greenbelt	MD, USA	richard.k.barry@nasa.gov
11	Jean-Philippe	**Beaulieu**	Institut d'Astrophysique de Paris	France	beaulieu@iap.fr
12	Andreas	**Becker**	University of Rostock	Germany	andreas.becker@uni-rostock.de
13	Bjoern	**Benneke**	MIT	MA, USA	bbenneke@mit.edu
14	David	**Bennett**	University of Notre Dame	IN, USA	bennett@nd.edu
15	Willy	**Benz**	University of Bern	Switzerland	wbenz@space.unibe.ch
16	Carolina	**Bergfors**	Max Planck Institute for Astronomy	Germany	bergfors@mpia.de
17	Andrea Ettore	**Bernagozzi**	Astronomical Observatory of the Aosta Valley	Italy	andrea.bernagozzi@gmail.com
18	Enzo	**Bertolini**	Astronomical Observatory of the Aosta Valley	Italy	direttore@oavda.it
19	Bertram	**Bitsch**	Universität Tübingen	Germany	bertram.bitsch@uni-tuebingen.de
20	Isabelle	**Boisse**	Institut d'Astrophysique de Paris	France	iboisse@iap.fr
21	Aaron	**Boley**	University of Florida, Gainesville	FL, USA	aaron.boley@gmail.com
22	Emeline	**Bolmont**	Laboratoire d'Astrophysique de Bordeaux	France	bolmont@obs.u-bordeaux1.fr
23	Mariangela	**Bonavita**	University of Toronto	Canada	bonavita@utoronto.ca
24	Aldo Stefano	**Bonomo**	Laboratoire d'Astrophysique de Marseille	France	aldo.bonomo@oamp.fr
25	William	**Borucki**	NASA Ames Research Center	CA, USA	William.J.Borucki@nasa.gov
26	Alan	**Boss**	Carnegie Institution of Washington	DC, USA	boss@dtm.ciw.edu
27	David	**Brown**	University of St Andrews	UK	djab@st-andrews.ac.uk
28	Joanna	**Bulger**	University of Exeter	UK	joanna@astro.ex.ac.uk
29	Adam	**Burgasser**	UCSD, La Jolla	CA, USA	aburgasser@ucsd.edu
30	Deborah	**Busonero**	INAF - Astronomical Observatory of Torino	Italy	busonero@oato.inaf.it
31	Susana Cristina	**Cabral de Barros**	Queen's University Belfast	UK	s.barros@qub.ac.uk
32	Juan	**Cabrera**	DLR German Aerospace Center	Germany	juan.cabrera@dlr.de
33	Elena	**Carolo**	INAF - Astronomical Observatory of Padova	Italy	elena.carolo@oapd.inaf.it
34	Ludmila	**Carone**	University of Köln	Germany	ludmila.carone@uni-koeln.de
35	Tullia	**Carriero**	INAF - Astronomical Observatory of Torino	Italy	carriero@oato.inaf.it
36	Marco	**Castronuovo**	ASI Headquarters, Roma	Italy	marco.castronuovo@asi.it
37	Alberto	**Cellino**	INAF - Astronomical Observatory of Torino	Italy	cellino@oato.inaf.it
38	Stefano	**Cesare**	Thales Alenia Space SpA, Torino	Italy	Stefano.Cesare@thalesaleniaspace.com
39	Gilles	**Chabrier**	CRAL/ENS Lyon	France	chabrier@ens-lyon.fr
40	David	**Charbonneau**	Harvard-Smithsonian CfA	MD, USA	dcharbon@cfa.harvard.edu
41	Sourav	**Chatterjee**	Northwestern University	IL, USA	souravchatterjee2010@u.northwestern.edu
42	Armando	**Ciampolini**	ALTEC SpA, Torino	Italy	armando.ciampolini@altecspace.it
43	Andrew	**Collier Cameron**	University of St Andrews	UK	acc4@st-and.ac.uk
44	Alexandre	**Correia**	Universidade de Aveiro	Portugal	correia@ua.pt
45	Vincent	**Coudé du Foresto**	LESIA, Paris Observatory	France	vincent.foresto@obspm.fr
46	Elisabeth	**Crespe**	CRAL/ENS Lyon	France	elisabeth.crespe@ens-lyon.fr
47	Bryce	**Croll**	University of Toronto	Canada	croll@astro.utoronto.ca
48	Szilard	**Csizmadia**	DLR German Aerospace Center	Germany	szilard.csizmadia@dlr.de
49	Mario	**Damasso**	Astronomical Observatory of the Aosta Valley	Italy	mario.damasso@studenti.unipd.it
50	Cilia	**Damiani**	INAF - Astronomical Observatory of Catania	Italy	damiani@oact.inaf.it

51	Melvyn	**Davies**	Lund Observatory	Sweden	mbd@astro.lu.se
52	Ernst	**de Mooij**	Leiden Observatory	Netherlands	demooij@strw.leidenuniv.nl
53	Magali	**Deleuil**	Laboratoire d'Astrophysique de Marseille	France	magali.deleuil@oamp.fr
54	Elisa	**Delgado Mena**	Instituto de Astrofisica de Canarias	Spain	edm@iac.es
55	Annalisa	**Deliperi**	INAF - Astronomical Observatory of Torino	Italy	deliperi@oato.inaf.it
56	Brice-Olivier	**Demory**	MIT	MA, USA	demory@mit.edu
57	Xavier	**Dumusque**	Geneva Observatory	Switzerland	xavier.dumusque@unige.ch
58	Natalia	**Dzyurkevich**	Max-Planck Institute for Astronomy	Germany	natalia@mpia.de
59	Jason	**Eastman**	The Ohio State University	OH, USA	jdeast@astronomy.ohio-state.edu
60	Anne	**Eggenberger**	Grenoble Observatory	France	anne.eggenberger@obs.ujf-grenoble.fr
61	Carlos	**Eiroa**	Universidad Autónoma de Madrid	Spain	carlos.eiroa@uam.es
62	Sebastian	**Elser**	University of Zurich	Switzerland	sebastian.elser@uzh.ch
63	Becky	**Enoch**	University of St Andrews	UK	be12@st-andrews.ac.uk
64	Anders	**Erikson**	DLR Institute of Planetary Research	Germany	anders.erikson@dlr.de
65	Daniel	**Fabrycky**	University of California, Santa Cruz	CA, USA	daniel.fabrycky@gmail.com
66	Francesca	**Faedi**	Queen's University Belfast	UK	f.faedi@qub.ac.uk
67	Fabio	**Favata**	ESA	Netherlands	Fabio.Favata@rssd.esa.int
68	Mario	**Flock**	Max-Planck Institute for Astronomy	Germany	flock@mpia.de
69	Eric	**Ford**	University of Florida, Gainesville	FL, USA	eford@astro.ufl.edu
70	Andrea	**Fortier**	University of Bern	Switzerland	andrea.fortier@space.unibe.ch
71	Luca	**Fossati**	The Open University	UK	l.fossati@open.ac.uk
72	Richard	**Freedman**	SETI Institute, NASA Ames Research Center	CA, USA	freedman@darkstar.arc.nasa.gov
73	Misato	**Fukagawa**	Osaka University	Japan	misato@iral.ess.sci.osaka-u.ac.jp
74	Pavel	**Gabor**	Vatican Observatory	Vatican City	p.gabor@jesuit.cz
75	Mario	**Gai**	INAF - Astronomical Observatory of Torino	Italy	gai@oato.inaf.it
76	Marina	**Galvagni**	University of Zurich	Switzerland	galva@physik.uzh.ch
77	Daniele	**Gardiol**	INAF - Astronomical Observatory of Torino	Italy	gardiol@oato.inaf.it
78	Nikolaos	**Georgakarakos**	ATEI of Western Macedonia	Greece	georgakarakos@hotmail.com
79	Paolo	**Giacobbe**	University of Trieste	Italy	paologiacobbe85@gmail.com
80	Neale	**Gibson**	University of Oxford	UK	Neale.Gibson@astro.ox.ac.uk
81	Michaël	**Gillon**	University of Liège	Belgium	michael.gillon@ulg.ac.be
82	Roberto	**Gilmozzi**	ESO	Germany	Roberto.Gilmozzi@eso.org
83	Vincenzo	**Giorgio**	Thales Alenia Space SpA, Torino	Italy	Vincenzo.Giorgio@thalesaleniaspace.com
84	Jonay I.	**Gonzalez Hernandez**	Instituto de Astrofisica de Canarias	Spain	jonay@iac.es
85	Raffaele	**Gratton**	INAF - Astronomical Observatory of Padova	Italy	raffaele.gratton@oapd.inaf.it
86	John Lee	**Grenfell**	Technische Universität Berlin	Germany	lee.grenfell@dlr.de
87	Olivier	**Gressel**	Queen Mary University, London	UK	o.gressel@qmul.ac.uk
88	Sheng-hong	**Gu**	Yunnan Astronomical Observatory	China	shenghonggu@ynao.ac.cn
89	Octavio Miguel	**Guilera**	Universidad Nacional de La Plata	Argentina	oguilera@fcaglp.unlp.edu.ar
90	Tristan	**Guillot**	Observatoire de la Cote d'Azur	France	tristan.guillot@oca.eu
91	Nader	**Haghighipour**	University of Hawaii	HI, USA	nader@ifa.hawaii.edu
92	Yasuhiro	**Hasegawa**	McMaster University	Canada	hasegay@physics.mcmaster.ca
93	Artie	**Hatzes**	Thueringerr Landessternwarte Tautenburg	Germany	artie@tls-tautenburg.de
94	Mathieu	**Havel**	Observatoire de la Cote d'Azur	France	mathieu.havel@oca.eu
95	Ravit	**Helled**	UCLA	CA, USA	rhelled@ucla.edu
96	Coel	**Hellier**	Keele University	UK	ch@astro.keele.ac.uk
97	Teruyuki	**Hirano**	University of Tokyo	Japan	hirano@utap.phys.s.u-tokyo.ac.jp
98	Matthew	**Holman**	Harvard-Smithsonian CfA	MA, USA	mholman@cfa.harvard.edu
99	Douglas	**Hudgins**	NASA Headquarters, Washington	DC, USA	Douglas.M.Hudgins@nasa.gov
100	Nawal	**Husnoo**	University of Exeter	UK	nawal@astro.ex.ac.uk

101	Shigeru	**Ida**	Tokyo Institute of Technology	Japan	ida@geo.titech.ac.jp
102	Ray	**Jayawardhana**	University of Toronto	Canada	rayjay@astro.utoronto.ca
103	Sheng	**Jin**	Purple Mountain Observatory	China	qingxiaojin@gmail.com
104	Anders	**Johansen**	Lund Observatory	Sweden	anders@astro.lu.se
105	Paul	**Kalas**	University of California, Berkeley	CA, USA	kalas@berkeley.edu
106	Lisa	**Kaltenegger**	Max-Planck Institute for Astronomy	Germany	lkaltene@cfa.harvard.edu
107	David	**Kirsh**	McMaster University	Canada	kirshdr@mcmaster.ca
108	Laszlo	**Kiss**	Konkoly Observatory	Hungary	kiss@konkoly.hu
109	Rainer	**Klement**	Max-Planck Institute for Astronomy	Germany	klement@mpia.de
110	Wilhelm	**Kley**	Universität Tübingen	Germany	wilhelm.kley@uni-tuebingen.de
111	Ludwik	**Kostro**	University of Gdansk	Poland	fizlk@univ.gda.pl
112	Ulrike	**Kramm**	University of Rostock	Germany	ulrike.kramm2@uni-rostock.de
113	Nobuhiko	**Kusakabe**	National Astronomical Observatory of Japan	Japan	nb.kusakabe@nao.ac.jp
114	Pierre-Olivier	**Lagage**	CEA-IRFU	France	pierre-olivier.lagage@cea.fr
115	Anne Marie	**Lagrange**	Laboratoire d'Astrophysique de Grenoble	France	lagrange@obs.ujf-grenoble.fr
116	Dong	**Lai**	Cornell University	NY, USA	dong@astro.cornell.edu
117	David	**Latham**	Harvard-Smithsonian CfA	MA, USA	dlatham@cfa.harvard.edu
118	Mario G.	**Lattanzi**	INAF - Astronomical Observatory of Torino	Italy	lattanzi@oato.inaf.it
119	Jeremy	**Leconte**	CRAL/ENS Lyon	France	jeremy.leconte@ens-lyon.fr
120	Alain	**Léger**	IAS, Paris	France	alain.leger@ias.fr
121	Monika	**Lendl**	Geneva Observatory	Switzerland	monika.lendl@unige.ch
122	Sebastiano	**Ligori**	INAF - Astronomical Observatory of Torino	Italy	ligori@oato.inaf.it
123	Giuseppe	**Lodato**	University of Milano	Italy	giuseppe.lodato@unimi.it
124	Christophe	**Lovis**	Geneva Observatory	Switzerland	christophe.lovis@unige.ch
125	Wladimir	**Lyra**	American Museum of Natural History	NY, USA	wlyra@amnh.org
126	Avi M.	**Mandell**	NASA-GSFC, Greenbelt	MD, USA	Avi.Mandell@nasa.gov
127	Geoffrey W.	**Marcy**	University of California, Berkeley	CA, USA	bhovers@astro.berkeley.edu
128	Rosemary	**Mardling**	Monash University	Australia	mardling@sci.monash.edu.au
129	Michele	**Martino**	ALTEC SpA, Torino	Italy	michele.martino@altecspace.it
130	Soko	**Matsumura**	University of Maryland	MD, USA	soko@astro.umd.edu
131	Anne-Sophie	**Maurin**	Laboratoire d'Astrophysique de Bordeaux	France	maurin@obs.u-bordeaux1.fr
132	Satoshi	**Mayama**	Graduate University for Advanced Studies, Kanagawa	Japan	mayama_satoshi@soken.ac.jp
133	Tsevi	**Mazeh**	Wise Observatory, Tel Aviv University	Israel	mazeh@post.tau.ac.il
134	Farzana	**Meru**	University of Exeter	UK	farzana@astro.ex.ac.uk
135	Yamila	**Miguel**	Universidad Nacional de La Plata	Argentina	ymiguel@fcaglp.unlp.edu.ar
136	Eliza	**Miller-Ricci Kempton**	University of California, Santa Cruz	CA, USA	elizamr@ucolick.org
137	Roberto	**Morbidelli**	INAF - Astronomical Observatory of Torino	Italy	morbidelli@oato.inaf.it
138	Christoph	**Mordasini**	Max Planck Institute for Astronomy	Germany	mordasini@mpia.de
139	Amaya	**Moro-Martin**	Centro de Astrobiologia (CSIC-INTA)	Spain	amaya@cab.inta-csic.es
140	Andres	**Moya**	Centro de Astrobiologia (CSIC-INTA)	Spain	amoya@cab.inta-csic.es
141	Alexander	**Mustill**	University of Cambridge	UK	ajm233@ast.cam.ac.uk
142	Smadar	**Naoz**	Northwestern University	IL, USA	snaoz@northwestern.edu
143	Norio	**Narita**	National Astronomical Observatory of Japan	Japan	norio.narita@nao.ac.jp
144	Marie-Eve	**Naud**	University of Montreal	Canada	naud@astro.umontreal.ca
145	Sergei	**Nayakshin**	University of Leicester	UK	sn85@astro.le.ac.uk
146	Richard	**Nelson**	Queen Mary University, London	UK	R.P.Nelson@qmul.ac.uk
147	Vasco	**Neves**	Universidade do Porto	Portugal	vasco.neves@astro.up.pt
148	Andrzej	**Niedzielski**	N. Copernicus University, Torun	Poland	aniedzi@astri.uni.torun.pl
149	Anna	**Nobili**	University of Pisa	Italy	nobili@dm.unipi.it
150	Aake	**Nordlund**	Niels Bohr Institute, Copenhagen	Denmark	aake@nbi.dk

151	Claudia	**Orlando**	Liceo Scientifico "Leonardo da Vinci", Pescara	Italy	orlando.jetlag@gmail.com
152	Mahmoudreza	**Oshagh**	Universidade do Porto	Portugal	moshagh@astro.up.pt
153	Fabio	**Pagan**	SISSA, Trieste	Italy	pagan@sissa.it
154	Enric	**Palle**	Instituto de Astrofisica de Canarias	Spain	epalle@iac.es
155	Olja	**Panic'**	ESO	Germany	opanic@eso.org
156	Neil	**Parley**	University of St Andrews	UK	neil.parley@st-andrews.ac.uk
157	Karla	**Peña Ramírez**	Instituto de Astrofísica de Canarias	Spain	karla@iac.es
158	Francesco	**Pepe**	Geneva Observatory	Switzerland	Francesco.Pepe@unige.ch
159	Hagai	**Perets**	Harvard-Smithsonian CfA	MA, USA	hperets@cfa.harvard.edu
160	Giovanni	**Picogna**	University of Padova	Italy	giovanni.picogna@studenti.unipd.it
161	Elke	**Pilat-Lohinger**	University of Wien	Austria	elke.pilat-lohinger@univie.ac.at
162	Ennio	**Poretti**	INAF - Astronomical Observatory of Brera	Italy	ennio.poretti@brera.inaf.it
163	Loredana	**Prisinzano**	INAF - Astronomical Observatory of Palermo	Italy	loredana@astropa.inaf.it
164	Didier	**Queloz**	Geneva Observatory	Switzerland	didier.queloz@unige.ch
165	Andreas	**Quirrenbach**	Thüringer Landessternwarte Tautenburg	Germany	A.Quirrenbach@lsw.uni-heidelberg.de
166	Natalie	**Raettig**	Max-Planck Institute for Astronomy	Germany	raettig@mpia.de
167	Heike	**Rauer**	DLR Institute of Planetary Research	Germany	heike.rauer@dlr.de
168	Sean	**Raymond**	Laboratoire d'Astrophysique de Bordeaux	France	rayray.sean@gmail.com
169	Zsolt	**Regaly**	Konkoly Observatory	Hungary	regaly@konkoly.hu
170	Martin	**Reidemeister**	AIU Jena	Germany	martin.reidemeister@astro.uni-jena.de
171	Alberto	**Riva**	INAF - Astronomical Observatory of Torino	Italy	riva@oato.inaf.it
172	Adrian	**Rodríguez Colucci**	Universidade de São Paulo	Brazil	adrian@astro.iag.usp.br
173	Leslie	**Rogers**	MIT	MA, USA	larogers@mit.edu
174	Cristoforo	**Romanelli**	ALTEC SpA, Torino	Italy	cristoforo.romanelli@altecspace.it
175	Johannes	**Sahlmann**	Geneva Observatory	Switzerland	Johannes.Sahlmann@unige.ch
176	Roberto	**Sanchis-Ojeda**	MIT	MA, USA	rsanchis@mit.edu
177	Esther	**Sanroma Ramos**	Instituto de Astrofisica de Canarias	Spain	mesr@iac.es
178	Alexandre	**Santerne**	Laboratoire d'Astrophysique de Marseille	France	alexandre.santerne@oamp.fr
179	Maria	**Sarasso**	INAF - Astronomical Observatory of Torino	Italy	sarasso@oato.inaf.it
180	Sara	**Seager**	MIT	MA, USA	seager@MIT.EDU
181	Damien	**Ségransan**	Geneva Observatory	Switzerland	Damien.Segransan@unige.ch
182	Franck	**Selsis**	Laboratoire d'Astrophysique de Bordeaux	France	franck.selsis@obs.u-bordeaux1.fr
183	Eugene	**Serabyn**	JPL	CA, USA	gene.serabyn@jpl.nasa.gov
184	Johny	**Setiawan**	Max-Planck Institute for Astronomy	Germany	setiawan@mpia.de
185	Michael	**Shao**	JPL	CA, USA	michael.shao@jpl.nasa.gov
186	Avi	**Shporer**	LCOGT, University of California, Santa Barbara	CA, USA	ashporer@lcogt.net
187	Roberto	**Silvotti**	INAF - Astronomical Observatory of Torino	Italy	silvotti@oato.inaf.it
188	Richard	**Smart**	INAF - Astronomical Observatory of Torino	Italy	smart@oato.inaf.it
189	Ignas	**Snellen**	Leiden Observatory	Netherlands	snellen@strw.leidenuniv.nl
190	Frank	**Sohl**	DLR Institute of Planetary Research	Germany	frank.sohl@dlr.de
191	Filomena	**Solitro**	ALTEC SpA, Torino	Italy	filomena.solitro@altecspace.it
192	Alessandro	**Sozzetti**	INAF - Astronomical Observatory of Torino	Italy	sozzetti@oato.inaf.it
193	Alessandro	**Spagna**	INAF - Astronomical Observatory of Torino	Italy	spagna@oato.inaf.it
194	Vlada	**Stamenkovic**	DLR Institute of Planetary Research	Germany	Vlada.Stamenkovic@dlr.de
195	Rachel	**Street**	Las Cumbres Observatory	CA, USA	rstreet@lcogt.net
196	Mark	**Swain**	JPL	CA, USA	swain@s383.jpl.nasa.gov
197	Yuhei	**Takagi**	Kobe University	Japan	takagi@stu.kobe-u.ac.jp
198	Yasuhiro	**Takahashi**	Graduate University for Advanced Studies, Tokyo	Japan	yasuhiro.takahashi@nao.ac.jp
199	Stuart F.	**Taylor**	National Tsing Hua University	Taiwan	astrostuart@gmail.com
200	Giovanna	**Tinetti**	University College London	UK	g.tinetti@ucl.ac.uk

201	Wesley	**Traub**	JPL	CA, USA	wtraub@jpl.nasa.gov
202	Amaury	**Triaud**	Geneva Observatory	Switzerland	Amaury.Triaud@unige.ch
203	Stephane	**Udry**	Geneva Observatory	Switzerland	stephane.udry@unige.ch
204	Ana L.	**Uribe**	Max Planck Institute for Astronomy	Germany	uribe@mpia.de
205	Diana	**Valencia**	Observatoire de la Cote d'Azur	France	valencia@oca.eu
206	Sylvie	**Vauclair**	LATT/OMP	France	sylvie.vauclair@ast.obs-mip.fr
207	Allona	**Vazan Shukrun**	Tel Aviv University	Israel	allonava@post.tau.ac.il
208	Ernesto	**Vittone**	ALTEC SpA, Torino	Italy	ernesto.vittone@altecspace.it
209	Eduard	**Vorobyov**	Southern Federal University	Russian Federation	vorobyov@astro.uwo.ca
210	Frank W.	**Wagner**	DLR Institute of Planetary Research	Germany	frank.wagner@dlr.de
211	Xiao-bin	**Wang**	Yunnan Astronomical Observatory	China	wangxb@ynao.ac.cn
212	Joshua	**Winn**	MIT	MA, USA	jwinn@mit.edu
213	Paul	**Withers**	Boston University	MA, USA	withers@bu.edu
214	Patricia	**Wood**	Keele University	UK	p.wood@epsam.keele.ac.uk
215	Günther	**Wuchterl**	Thüringer Landessternwarte Tautenburg	Germany	gwuchterl@TLS-Tautenburg.de
216	Chao-Chin	**Yang**	American Museum of Natural History	NY, USA	cyang@amnh.org
217	Olga	**Zakhozhay**	Main Astronomical Observatory NAS, Kyiv	Ukraine	zkholga@mail.ru
218	Maria Rosa	**Zapatero Osorio**	Centro de Astrobiologia (CSIC-INTA)	Spain	mosorio@cab.inta-csic.es

International Astronomical Union

U n i o n A s t r o n o m i q u e I n t e r n a t i o n a l e

POST MEETING REPORT FORM

The following documents should be attached:

i Final Scientific Program

ii List of participants

iii List of recipients of IAU Grants, including amount and country & receipts signed by the recipients of IAU Grants

vi Brief report (text.txt file or word.doc) to the Executive Committee on the scientific highlights of the meeting (1-2 pages)

1. Meeting Number**: IAU Symposium No. 277**

2. Meeting Title: **Tracing the Ancestry of Galaxies (on the land of our ancestors)**

3. Coordinating Division: **Division VIII: Galaxies and the Universe**

4. Dedication of meeting (if any):

5. Location (city, country): **Ouagadougou, Burkina Faso**

6. Dates of meeting: **13-17 December 2010**

7. Number of participants: **97**

8. List of represented countries: (see list of participants)

9. Report submitted by: **Claude Carignan**

10. Date and place: **20 January 2011**

11. Signature of SOC Chairperson:

Report to the Executive Committee

IAU Symposium No. 277

Tracing the Ancestry of Galaxies (on the land of our ancestors)

December 13-17, Ouagadougou, Burkina Faso

This Symposium was the opportunity to examine the possible links between nearby, mature galaxies and the distant objects that our deepest extragalactic surveys now routinely uncover. Major open questions pertaining to the evolution of these objects into the galaxies we see today were addressed and confronted to theoretical models of galaxy formation and evolution. In recent years, the multi-wavelength mapping of galaxies has enabled a new vision of their structure and composition that may, or may not, be compatible with theoretical precepts.

We are living the golden era of multi-wavelength observations **(Scientific sessions 1 & 2)** with COSMOS, GOODS, MUSYC, AEGIS and several other surveys probing deep areas of the sky. In the Local Universe, multi-wavelength observations have also reached the survey era with SDSS, SINGS, SINGG, NGVS among others. Sophisticated instrumentation are allowing the comparison of spatially resolved measurements of the dynamics and chemical composition of galaxies at high redshifts with high-resolution kinematical and abundance maps of local galaxy, possibly yielding new insights into the mass assembly **(Scientific session 8)** and the integrated star formation history of galaxies.

There is emerging evidence that the properties of $z >\sim 2$ galaxies are quite drastically different from those of the galaxies in the local universe. Disks appear to be more turbulent and gas-rich, early-types appear to be much smaller for a given mass than their local counterparts and morphologies do not fit in the Hubble sequence of present-day galaxies. Moreover, $z \sim 1$ seems to be the epoch of transition where galaxies start to resemble more the present-day population and where star formation starts to decrease.

One legitimate question the participants tried to answer was: can we really apply the knowledge gained from low-z studies to the high-z galaxy populations, in view of the strong apparent differences in observed properties? Or do we still have to rely heavily on models/simulations, often based on simplified and likely inadequate recipes for the complex and poorly constrained physical processes involved to interpret high-z observations **(Scientific sessions 7 & 10)**? With the next generation of facilities coming on line worldwide or in final design stage (e.g. Atacama Large Millimeter Array, Extremely Large Telescopes, James Webb Space Telescope, Large Synoptic Survey Telescope, Square Kilometer Array, etc.) that will allow us to probe galaxies at redshifts z=1 or beyond with similar precision as in the local Universe, the time was right at the end of 2010 to assess the current status of the field.

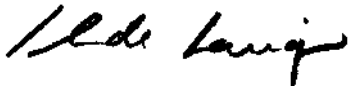
This Symposium brought together theorists and observers in an attempt to reach a common understanding of the puzzles that our research has recently unfolded, largely through the study of galaxy dynamics **(Scientific sessions 3 & 4)** and their stellar populations **(Scientific session 5)** at low and high redshifts. With Meerkat (Karoo Array Telescope) and Salt (South African Large Telescope) in operation in South Africa and Astrophysics being developed in Burkina Faso, it seemed timely to hold such a meeting in Africa, especially following the IYA and the resolution of the 2009 IAU General Assembly asking to support the development of Astronomy in emerging countries.

The education side was not left out **(Scientific session 6)** with a discussion of the IAU Strategic Plan: Astronomy for the Developing World and different tools presented for astronomy teaching (e.g. IAU/TAD) and research (e.g. virtual observatory). In parallel with the science symposium, there was also a very successful 2 days IAU/TAD workshop to form 50 (1 per province and 5 from Ouagadougou) Burkinabè secondary school teachers. The program of the workshop was prepared by Michèle Gerbaldi (IAP) and the formation was given by Ed Guinan (Villanova: president IAU/TAD), Rosa Maria Ros (Catalunya: president of IAU Commission 46), Jean-Pierre de Greve (Brussels) and Katrien Kolenberg (Wien).

Also, in parallel with the scientific symposium, there was another 2 days workshop to define the basis of what will become the African Astronomical Society (AfAS), which should be launched, in the coming year. African from 12 different African countries participated to the AfAS workshop.

Finally, outreach activities were not left out. During the meeting, Symposium's participants gave 3 public lectures at the Centre Culturel Français and 7 participants gave talks in Ouagadougou's schools.

We can say that this first IAU Symposium in Sub Saharan Africa (outside South Africa) was a great success. This gave a big boost to the new Astrophysics program at the University de Ouagadougou and to the rebuilding of the Marly Telescope in the northeastern part of the country.

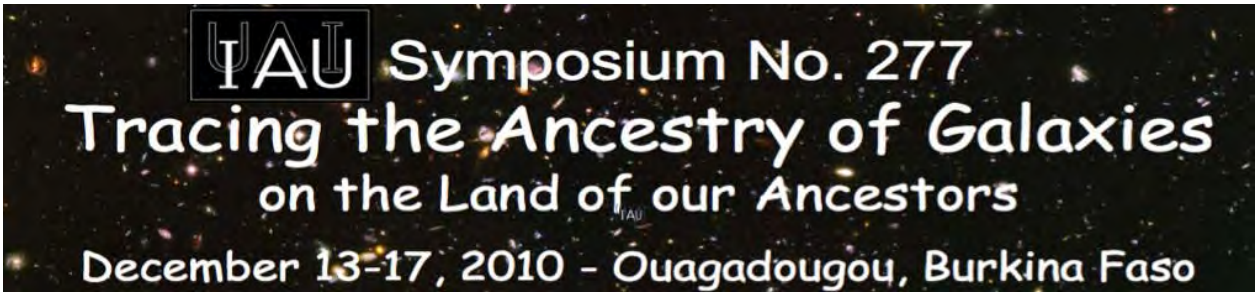


_____

Claude Carignan

Co-chair of the SOC

IAU Symposium No. 277



Symposium Program

and

Absracts of the presentations

MESSRS Université de Montréal UNESCO IUPAP UPPSALA UNIVERSITET IAU

Symposium Program

Sunday, December 12, 2010

Time	Event
15:00 – 20:00	Registration
18:00 – 21:00	Welcoming reception: Hôtel Indépendance

Monday, December 13, 2010

Time	Opening ceremony
08:30 – 08:40	Opening remarks: Claude Carignan, co-chair of the Symposium
08:40 – 08:45	Opening remarks: Ken Freeman, co-chair of the Symposium
08:45 – 08:50	Opening remarks: George Miley, vice-president of the IAU
08:50 – 09:00	Opening remarks: Prof. Jean Koulidiati, président de l'Université de Ouagadougou
09:00 – 09:10	Opening remarks: Prof. Joseph Paré, ministre des Enseignements Secondaire, Supérieur et de la Recherche Scientifique (MESSRS)
09:10 – 10:00	Coffee break & meeting with the local representatives

Scientific Session 1	Large Photometric (UV, optical, IR) Surveys
chairman	Ken Freeman (MSO)
R1.1: 10:00 - 10:45	Christopher Martin (CalTech) Exploring Galaxy Evolution with GALEX UV Surveys - review
R1.2: 10:45 - 11:30	Mark Dickinson (NOAO) Observing Galaxy Assembly with Optical and Infrared Surveys - review
11:30 – 12:30	Contributed Talks
C1.3: 11:30 – 11:50	Shinya Komugi (ALMA/NAOJ) The AKARI Far-Infrared All-Sky Survey Image: Dust Properties of Galaxies in the Local Universe
C1.4: 11:50 – 12:10	Veronique Buat (Laboratoire d'Astrophysique de Marseille – LAM) Hidden and Visible Star Formation in Galaxies: What do we Learn from AKARI and Herschel?

C1.5: 12:10 – 12:30	Florence Durret (Institut d'Astrophysique de Paris) Environmental Effects on Galaxy Luminosity Functions in Clusters
Scientific Session 2	Large HI & CO Surveys
chairman	Erwin de Blok (UCT)
R2.1: 14:30 - 15:15	Jacqueline van Gorkom (Columbia University) Gas and Galaxy Evolution in the Local Universe - review
R2.2: 15:15 - 16:00	Françoise Combes (Observatoire de Paris, LERMA) Surveys of the Molecular Content of Galaxies at all z - review
16:00 – 16:30	Coffee break
16:30 - 18:30	Contributed Talks
C2.3: 16:30 – 16:50	Martin Bureau (University of Oxford) Molecular Gas and Star Formation in Local Early-Type Galaxies
C2.4: 16:50 – 17:10	George Heald (ASTRON) The WSRT HALOGAS Survey: Status and First Results
C2.5: 17:10 – 17:30	Jonathan Braine (Laboratoire d'Astrophysique de Bordeaux) The Herschel M33 Extended Survey: Gas and Dust in M33
C2.6: 17:30 – 17:50	Nario Kuno (Nobeyama Radio Observatory) NRO Legacy Project: M33 all Disk Survey of Giant Molecular Clouds with NRO 45-m and ASTE 10-m Telescopes
C2.7: 17:50 – 18:10	Gyula I. G. Jozsa (ASTRON - NWO) Warps and Accretion
C2.8: 18:10 – 18:30	Bradley Frank (University of Cape Town) Comparisons of HI and CO Dynamics of THINGS Galaxies

Tuesday, December 14, 2010

Scientific Session 3	Large 3D Kinematical Surveys - low z
chairman	Martin Bureau (Oxford)
R3.1: 08:30 - 09:15	Eric Emsellem (ESO) 3D Spectroscopic Surveys of Early-Type Galaxies - review
R3.2: 09:15 - 10:00	Philippe Amram (Laboratoire d'Astrophysique de Marseille) 3D Spectroscopic Surveys of Late-Type Galaxies - review
10:00 – 10:30	Coffee Break
10:30 - 12:30	Contributed Talks
C3.3: 10:30 – 10:50	Erwin de Blok (University of Cape Town) Large HI Surveys with MeerKAT
C3.4: 10:50 – 11:10	Luis Ho (Carnegie Observatories) The Carnegie-Irvine Nearby Galaxies Survey

C3.5: 11:10 – 11:30	Carmelle Robert (Université Laval) The Study of Barred Spiral Galaxies with IFUs
C3.6: 11:30 – 11:50	Olivier Hernandez (LAE – Université de Montréal) Tracing the Ancestry of Galaxies using 3D Spectroscopy
C3.7: 11:50 – 12:10	Laurent Drissen (Université Laval) SpIOMM and Sitelle: Wide-Field Hyperspectral Imagers for the Study of Galaxy Evolution
C3.8: 12:10 – 12:30	Petri Vaisanen (South African Astronomical Observatory) African Eyes on the Sky - the Southern African Large Telescope

Scientific Session 4	Large 3D Kinematical Surveys - high z
chairman	Françoise Combes (OBSPM)
R4.1: 14:30 - 15:15	Olivier Le Fèvre (Laboratoire d'Astrophysique de Marseille) Large High Redshift Spectroscopic Surveys - review
R4.2: 15:15 - 16:00	Benoit Épinat (Laboratoire d'Astrophysique de Toulouse - Tarbes) Spectroscopic surveys: Exploring Galaxy Evolution Mechanisms - review
16:00 – 16:30	Coffee break
16:30 - 18:30	Contributed Talks
C4.3: 16:30 – 16:50	Thierry Contini (Laboratoire d'Astrophysique de Toulouse - Tarbes) Probing the Mass Assembly and Chemical Evolution of High-z Galaxies with MASSIV
C4.4: 16:50 – 17:10	Mathieu Puech (GEPI - Observatoire de Paris) The Evolution of the Baryonic Tully-Fisher Relation over the past 6 Gyr
C4.5: 17:10 – 17:30	Caitlin Casey (University of Hawai'i) Completing the Census of High-z Extreme Starbursts
C4.6: 17:30 – 17:50	Thiago Gonçalves (Caltech) Lyman Break Analogs: Constraints on the Formation of Extreme Starbursts at Low and High Redshift
C4.7: 17:50 – 18:10	Loic Le Tiran (GEPI - Observatoire de Paris) The Turbulent ISM of Galaxies about 10 Gyrs ago: an Impact on their IMF?
C4.8: 18:10 – 18:30	Pheneas Nkundabakura (Kigali Institute of Education) Unveiling the Nature of two Unidentified Blazar Candidates Through Spectroscopic Observations

Wednesday, December 15, 2010

Scientific Session 5	Stellar Populations in the Local Universe and at high Z and Galaxy Evolution

chairman	Stéphane Courteau (Queen's)
R5.1: 08:30 - 09:15	Claudia Maraston (University of Portsmouth) Stellar Populations at High Redshift - review
R5.2: 09:15 - 10:00	~~Jarle Brinchmann (Leiden Observatory) Stellar Populations in the Low Redshift Universe, from the Oldest to the Youngest – review~~
10:00 – 10:30	Coffee break
10:30 - 12:30	Contributed Talks
C5.3: 10:30 – 10:50	Isabel Perez (Universidad de Granada) Tracing the Origin of Bars and Bulges Through the Study of their Stellar and Ionized Gas Properties
C5.4: 10:50 – 11:10	Roberto Maiolino (Astronomical Observatory of Rome) The Metallicity Evolution of Galaxies Through the Cosmic Epochs
C5.5: 11:10 – 11:30	Jonas Johansson (University of Portsmouth) The Chemical Enrichment Histories of SDSS Galaxies
C5.6: 11:30 – 11:50	Sara Ellison (University of Victoria) Gas Flows in Galaxies: Mergers and Bars
C5.7: 11:50 – 12:10	Hitoshi HANAMI (Iwate University) Reconstruction of Star Formation and AGN Activities in Galaxies Classified with the Balmer Break, 1.6 μm Bump and PAH Features up to z=2
C5.8: 12:10 – 12:30	Abiy Tekola (University of Cape Town) The Environments of Local Luminous Infrared Galaxies (LIRGS) and their Star Formation Density Relationship

Thursday, December 16, 2010

Education Session 6	Teaching Aids for Astronomy (High School & Undergraduate): Open to Local Teachers
chairman	Pius Okeke (CBSS – Nigeria)
R6.1: 08:30 - 09:05	George Miley (Leiden Observatory), Claude Carignan (Université de Ouagadougou) & Kevin Govender (OAD) The IAU Strategic Plan: Astronomy for the Developing World - review
R6.2: 09:05 - 09:40	Jean-Pierre de Greve (Vrije Universiteit Brussel) Astronomy Education: the Road to Enthusiasm for Studying Science - review
R6.3: 09:40 - 10:15	Edward Guinan (Villanova University / IAU TAD Program) The IAU Teaching Astronomy for Development (IAU/TAD) Program: Focus on Africa - review
10:15 – 10:45	Coffee break

Education Session 6	The Virtual Observatory (VO): A Wealth of Data for Astronomical Research in Africa and Worldwide
R6.4: 10:45 - 11:20	David Schade (CADC) The Post-Virtual Observatory World View - review
R6.5: 11:20 - 11:55	Christian Surace (LAM) The Virtual Observatory : Data, Standards and Tools - review
C6.6: 11:55 – 12:30	Ruben Sanchez-Janssen (ESO) AVOCADO: A Virtual Observatory Census to Address Dwarfs Origins

Scientific Session 7	Confronting Cosmological Simulations and Galaxy Evolution Models with Galaxy Samples
chairman	Joe Silk (Oxford)
R7.1: 14:30 - 15:15	Simon White (Max Planck Institute for Astrophysics, Garching) Simulating the Evolution of the Galaxy Population - review
R7.2: 15:15 - 16:00	~~Joop Schaye (Leiden Observatory) Hydrodynamical Simulations of the Formation of Galaxies - review~~
16:00 – 16:30	Coffee break
16:30 - 18:30	Contributed Talks
C7.3: 16:30 – 16:50	Leila Powell (CEA-Saclay) The Impact of ISM Turbulence, Clustered Star Formation and Feedback on Galaxy Mass Assembly Through Cold Flows and Mergers
C7.4: 16:50 – 17:10	Pierre-Alain Duc (AIM, CEA Paris Saclay) Reconstructing the Mass Assembly of Early-type Galaxies with Collisional Debris
C7.5: 17:10 – 17:30	Patricia Sanchez-Blazquez (Universidad Autonoma de Madrid) Quantifying the Redistribution of Mass and Angular Momentum in the Galactic Disks due to Bars
C7.6: 17:30 – 17:50	Paola Di Matteo (GEPI - Observatoire de Paris) Gas Inflows and Metallicity Evolution in Merging Pairs
C7.7: 17:50 – 18:10	Margarita Rosado (IA-UNAM) Dynamics of Interacting Galaxies
C7.8: 18:10 – 18:30	Hugo Martel (Université Laval) Chemical Signature of Gas-Rich Disc-Disc Mergers at High Redshift

Friday, December 17, 2010

Scientific Session 8	Mass assembly
chairman	Olivier Le Fèvre (LAM)

R8.1: 08:30 - 09:15	Christopher J. Conselice (University of Nottingham) An Empirical Review of Galaxy Formation - review
R8.2: 09:15 - 10:00	Joe Silk (Oxford University) The Role of Feedback in Baryon Acquisition - review
10:00 – 10:30	Coffee break
10:30 - 12:30	Contributed Talks
C8.3: 10:30 – 10:50	Lidia Tasca (Laboratoire d'Astrophysique de Marseille) Where is the Light? Evolution of Bulges and Disks since z~0.8
C8.4: 10:50 – 11:10	Marcin Sawicki (Saint Mary's University) The Build-up of Stellar Mass in High-Redshift Galaxies
C8.5: 11:10 – 11:30	D.J. Pisano (West Virginia University) The Evolution of Luminous Compact Blue Galaxies: Disks or Spheroids?
C8.6: 11:30 – 11:50	Hector Bravo-Alfaro (Universidad de Guanajuato, Mexico) Environmental Effects in Galaxy Clusters: HI-VLA, CO_IRAM and Deep NIR Imaging in Abell 1367 and Abell 85
C8.7: 11:50 – 12:10	Brent Tully (University of Hawai'i) Cosmic Flows
C8.8: 12:10 – 12:30	Hakeem Oluseyi (Florida Institute of Technology) LSST Observations of RR Lyrae Stars for Mapping Galactic Halos Throughout the Local Group

Scientific Session 9	Unsolved problems
chairman	Claude Carignan (UdeO & UdeM)
R9.1: 14:30 - 15:15	Stéphane Courteau (Queen's) Scaling Relations of Galaxies - review
15:15 - 16:55	Contributed Talks
C9.2: 15:15 – 15:35	Marie-Maude de Denus-Baillargeon (Université de Montréal) Fixing the Stellar Disk-to-Luminosity Ratio for Kinematics Studies in Individual Galaxies
C9.3: 15:35 – 15:55	Denis Burgarella (Laboratoire d'Astrophysique de Marseille) The Herschel FIR Emission of Lyman Break Galaxies at $0.8 < z < 2.5$ (GALEX Dropouts) in the GOODS Fields: Do we Understand Everything?
C9.4: 15:55 – 16:15	Timothy Davidge (Herzberg Institute of Astrophysics) Shaken, but not Stirred: The Disrupted Disk of NGC 253
C9.5: 16:15 – 16:35	Bruce Partridge (Haverford College) What Radio Astronomy Can Tell us about Galaxy Formation
C9.6: 16:35 – 16:55	Kambiz Fathi (Stockholm Observatory) Scale Length of Disk Galaxies in the Local Universe
16:55 – 17:30	Coffee break

Scientific Session 10	Panel Discussion & Conference Summary
17:30- 18:00	Can we really apply the knowledge gained from low-z studies to the high-z galaxy populations or do we still have to rely heavily on models/simulations?
18:00 - 18:30	Conference Summary (Ken C. Freeman) & Closing Remarks (Claude Carignan)

Abstracts – Oral Presentations

Philippe Amram (Laboratoire d'Astrophysique de Marseille)

3D Spectroscopic Surveys of Late-Type Galaxies (R3.2)

I will review a few science topics, which are being specifically addressed by on-going surveys of nearby spiral galaxies via integral-field spectroscopy, focusing on the dynamical status and evolution of these systems.

Jonathan Braine (Laboratoire d'Astrophysique de Bordeaux)

The Herschel M33 Extended Survey: Gas and Dust in M33 (C2.5)

HerM33ES team

Messier 33 is a small Local Group spiral galaxy with a sub solar metallicity, blue colors, and is gas-rich properties which are common to early universe objects. Here we present observations with the Herschel satellite of the cool dust emission, and the derived gas and dust masses, along with new high-quality CO and HI observations. The goal is to understand the cycle of star formation from the atomic gas to the denser molecular phase and finally into stars in a low metallicity environment, not available in our galaxy. The sensitive submillimeter observations allow us to independently measure the gas mass of M33, checking whether CO can be used to trace H2 and whether the Star Formation Efficiency (defined here as the star formation rate per H2 mass) is indeed higher in sub solar metallicity galaxies as a number of recent articles have suggested. The rapid increase in the star formation rate density with redshift to z~1 ("Madau plot") shows that the SFE is higher in these objects. The HerM33ES project will determine whether this is also the case for M33 and, if so, provide substantial information to understand why. The CO and HI observations resolve the molecular clouds as do some of the continuum measurements, allowing us to examine where the additional material is found. Both radial gradients in dust temperature / properties and the characteristics of individual clouds identified will be discussed.

Hector Bravo-Alfaro (Universidad de Guanajuato, Mexico)

Environmental Effects in Galaxy Clusters: HI-VLA, CO-IRAM and Deep NIR Imaging in Abell 1367 and Abell 85 (C8.6)

Tom Scott, Elias Brinks, Divakara Mayya, Florence Durret

We carry on a multifrequency survey of late type galaxies in nearby clusters with the

aim of investigate the effects exerted by both, the very local and the global cluster environments. In the last few years we obtained new VLA-HI images and IRAM-CO spectra of galaxies in different zones of Abell 1367, with the goal of studying the evolution of the gaseous components at different distances from this system. In Abell 85 we perform a deep NIR imaging survey of the brightest spirals projected up to 1.0 Abell radius, with the aim of unveiling possible gravitational effects on their stellar disks. Here we show preliminary results of these projects, mainly focused on infalling compact groups of galaxies moving towards their respective cluster centers.

Veronique BUAT (Laboratoire d'Astrophysique de Marseille)

Hidden and Visible Star Formation in Galaxies: what do we Learn from AKARI and Herschel? (C1.4)

Elodie Giovannoli, Sebastien Heinis, Denis Burgarella LAM

Herschel opens a large field of investigations on the hidden star formation in galaxies. Combining UV and far-IR data allows us to measure all the star formation in galaxies and to estimate the net dust attenuation. The analysis can be performed from the local universe using IRAS, AKARI and GALEX all sky data to high z (up to z<2) by combining deep GALEX and U data with the Herschel detections from the HerMES and H-GOODS projects. The calibration of the star formation rates and dust attenuation in the nearby universe is reinvestigated by the combination of AKARI, SDSS and GALEX data. At higher z, we present the results of the first analyses performed with Herschel data from the science demonstration phase and discuss the reliability of SFRs measured with only IR or UV measurements for galaxy samples directly selected in IR as well as the measure of dust attenuation.

Martin Bureau (University of Oxford)

Molecular Gas and Star Formation in Local Early-Type Galaxies (C2.3)

The molecular gas content of local early-type galaxies is constrained and discussed in relation to their evolution. First, as part of the Atlas3D survey, we present the first complete, large (>250 objects), volume-limited survey of CO in normal local early-type galaxies, obtained with the IRAM 30m telescope. We find a surprisingly high detection rate of 23%, independent of mass and environment but dependent on the specific stellar angular momentum. Second, using CO synthesis imaging with PdBI and CARMA, the extent of the molecular gas is constrained and a variety of morphologies is revealed. The kinematics of the molecular gas and stars are often misaligned, implying an external gas origin in over a third of the systems, although this behaviour is drastically diffferent between field and cluster environments. Third, many objects appear to be in the process of forming regular kpc-size decoupled disks, and a star formation sequence can be sketched by piecing together multi-wavelength information on the molecular gas, current star formation, and young stars. This

suggests an outside-in cessation of star formation. Fourth, early-type galaxies do not seem to systematically obey all our usual prejudices regarding star formation, following the standard Schmidt-Kennicutt law but not the far infrared-radio continuum correlation. This may suggest a greater diversity in star formation processes than observed in disk galaxies and the possibility of "morphological quenching". Lastly, evidence of a large-scale AGN-driven molecular outflow in a local early-type galaxy is presented, and a case is presented to establish the viability of CO-based Tully-Fisher studies in early-types.

Denis Burgarella (Laboratoire d'Astrophysique de Marseille)

The Herschel Far Infrared Emission of Lyman Break Galaxies at 0.8 < z < 2.5 (GALEX dropouts) in the GOODS fields: do we Understand Everything ? (C9.3)

V. Buat, O. Ilbert, E. Giovannoli, S. Heinis et al.

From GALEX Far-UV and Near-UV photometry combined with optical and Near-IR photometry, we have selected two samples of Lyman Break Galaxies (LBGs): a FUV dropout sample at 0.8 < z < 1.5 and a NUV dropout sample at 1.5 < z < 2.5. Using Herschel, we have been able to constrain the dust emission of these two LBG samples for the first time statistically at high redshift using FIR data. A FUV-to-FIR Bayesian SED fitting using the code CIGALE (http://cigale.oamp.fr) allows us to estimate physical parameters of these galaxies and study their formation and evolution. We will present these results in a more general context including higher redshift LBGs.

Caitlin Casey (University of Hawai'i)

Completing the Census of High-z Extreme Starbursts (C4.5)

Ultraluminous infrared galaxies (ULIRGs) exhibit the most extreme star formation rates in the Universe. At early epochs (z>1), ULIRG activity contributes significantly to hte build-up of stellar mass through intense star-forming bursts (with Tau~<100Myr, SFR~>500M/yr). Since the observed properties of these starbursts are short-lived and extreme, they are thought to be triggered by the collision of gas-rich disk galaxies and serve as a fundamental transition phase to luminous active galactic nuclei. While ULIRGs are likely responsible for the formation of massive elliptical galaxies in the local Universe, much about the population is still unknown due to limitations in far-infrared (FIR) observations, strong selection biases, and sample inhomogeneity. Submillimeter Galaxies (SMGs, a subset of z>1 ULIRGs) put powerful constraints on galaxy evolution theories and the environments of heavy star formation, but their selection at 850um is susceptible to strong temperature and redshift biasing. This implies that a significant fraction of high-z ULIRGs have yet to

be discovered. The current generation of infrared and radio instruments - Herschel, SCUBA2, ALMA, EVLA, and eMERLIN - will dramatically improve our census of luminous starbursts in the early Universe and allow detailed study of their formation and evolution.

Francoise Combes (Observatoire de Paris, LERMA)

Surveys of the Molecular Content of Galaxies at all z (R2.2)

I will review some recent results about the molecular content of galaxies, obtained essentially from the CO lines, but also dense tracers, or the dust continuum emission. New results have been obtained on molecular cloud physics, and their efficiency to form stars, shedding light on the Kennicutt-Schmidt law as a function of surface density and galaxy type. Large progress has been made on galaxy at moderate and high redshifts, allowing to interprete the star formation history and star formation efficiency as a function of gas content, or galaxy evolution. In massive galaxies, the gas fraction was higher in the past, and galaxy disks were more unstable and more turbulent. ALMA observations will allow the study of more normal galaxies at high z with higher spatial resolution and sensitivity.

Christopher Conselice (University of Nottingham)

An Empirical Review of Galaxy Formation (R8.1)

I will present the first full analysis of the modes of galaxy formation for massive galaxies with log M > 11 at z < 3. I will discuss the role of major mergers, star formation, AGN feedback, and for the first time, minor mergers, in the formation of massive galaxies down to z = 0. This is possible due to using a new largish NIR Hubble Space Telescope imaging from NICMOS focused on massive galaxies in the nearby universe, called the GOODS NICMOS Survey (GNS). I will further show that modes besides the above are needed to form galaxies, and will argue that gas accretion is an important method for adding mass to the most massive galaxies and potentially a major part of the galaxy formation process. This provides some of the first circumstantial evidence for gas infall as a major mode of galaxy formation. I will finally demonstrate how the new WFC3 camera and the largest HST program ever that will use it, CANDELS, will further advance our knowledge of these problems in future years.

Thierry Contini (Laboratoire d'Astrophysique de Toulouse-Tarbes)

Probing the Mass Assembly and Chemical Evolution of High-z Galaxies with MASSIV (C4.3)

B. Epinat, J. Queyrel, J. Moultaka (LATT, Toulouse), B. Garilli, L. Paioro (INAF, Milano), D. Vergani (Bologna), L. Tasca, P. Amram, O. Le Fèvre, L. Tresse (LAM, Marseille), M. Kissler-Patig (ESO, Garching), E. Perez-Montero (IAA, Granada)

Understanding the different mechanisms of galaxy assembly at various cosmic epochs is a key issue for galaxy evolution and formation models. I will present MASSIV (Mass Assembly Survey with SINFONI in VVDS) in this context, an on-going survey with VLT/SINFONI aiming to probe the kinematics and chemical abundances of a unique sample of ~80 star-forming galaxies selected in the redshift range z~1-2. This large sample, spanning a wide range of stellar masses (logM=[9-12]), is unique at these high redshifts and statistically representative of the overall galaxy population. In this talk, I will first give an overview of the MASSIV survey and then focus on the spatially-resolved chemical properties of high-z galaxies and their implication on the process of galaxy assembly (smooth gas accretion, mergers, ...).

Stéphane Courteau (Queen's University)

Scaling Relations of Galaxies (R9.1)

Aaron Dutton, Mike McDonald, Joel Roediger

We review current scaling relations of nearby gas-poor and gas-rich galaxies and use the constraints provided by their zero-point, slope and scatter to infer properties about their mass distribution, specific star formation rates, halo formation models, and more.

Timothy Davidge (Herzberg Institute of Astrophysics)

Shaken, but not Stirred: The Disrupted Disk of NGC 253 (C9.4)

Deep images obtained with the CFHT WIRCam are used to explore the disk and extraplanar regions of the nearby star burst galaxy NGC 253. We find a diffuse extraplanar component located in the eastern half of the galaxy that extends out to 20 kpc or more from the galaxy center. The K-band LF of the extraplanar stars is consistent with that of a population that experienced a continuous star forming rate up to 0.5 Gyr in the past, at which point star formation was terminated. These stars likely formed in the disk of NGC 253, but were scattered out of the disk plane during a tidal encounter 0.5 Gyr in the past. This same encounter probably also triggered the elevated levels of star formation seen throughout the disk and center of NGC 253.

Erwin de Blok (University of Cape Town)

Large HI Surveys with MeerKat (C3.3)

MeerKAT is the South-African SKA precursor, currently under development in the Karoo desert. Recently, the outcomes of an international call for Large Survey Project were announced and 10 projects, taking a total of 5 years of observing time, were selected. I give a short overview of the state of the MeerKAT project, and describe the HI survey projects that were selected.

Marie-Maude de Denus-Baillargeon (Université de Montréal)

Fixing the Stellar Disk-to-Luminosity Ratio for Kinematics Studies in Individual Galaxies (C9.2)

Claude Carignan (Université de Montréal, Université de Ouagadougou), Samuel Boissier (Laboratoire d'astrophysique de Marseille), Olivier Hernandez (Université de Montréal), Zacharie Kam Sié (Université de Montréal), Yacouba Djabo (Université de Montréal)

The exact contribution of stellar disks to the overall kinematics of a galaxy remains in most studies a free parameter of the mass models. With the help of population synthesis models, it is now possible to have a coherent picture of the stellar population of a galaxy including its mass-to-luminosity ratio at every radius spanning a wide range of observable wavelengths. This talk will focus on discussing the consistency of the mass thus inferred in observation bands ranging from the FUV to the NIR for individual galaxies. We will also compare disk properties of a small subsample of SINGS galaxies and examine the agreement between the parameters used by the population synthesis models and the dark matter haloes modeled by kinematic analyses.

Jean-Pierre De Greve (Vrije Universiteit Brussel)

Astronomy Education: the Road to Enthusiasm for Studying Science (R6.2)

A brief analysis is given of the need for more trained people in science and technology versus the declined interest in studying sciences. In highlighting some of the frontier research in astronomy, arguments are presented why astronomy education is by far the most attractive way to stimulate young people to study sciences later on. Finally, some examples are given of successful astronomy projects with and without technological means.

Paola Di Matteo (Observatoire de Paris, GEPI)

Gas Inflows and Metallicity Evolution in Merging Pairs (C7.6)

M. Montuori (CNRS, Rome, Italy) M. Lehnert (Paris Observatory, France) F. Combes (Paris Observatory, France) B. Semelin (Paris Observatory, France)

Interactions of disk galaxies generally induce strong inflows of gas from the outer disk to the inner kiloparsecs. This inflow of relatively low-metallicity gas dilutes the metallicity of the circumnuclear gas. By means of numerical simulations, we have investigated several aspects of the process as the timing and duration of the dilution and its correlation with the induced star formation. Our results show that the strongest trend is between the star formation rate and the dilution of the metals in the nuclear region; i.e., the more intense the central burst of star formation, the more the gas is diluted. The strong inflows happen on timescales of about 10^8 years or less, and the most intense star formation and lowest gas phase metallicities are seen generally after the first pericentre passage. As the star formation proceeds and the merger advances, the dilution reduces and enrichment becomes dominant - ultimately increasing the metallicity of the circumnuclear gas to a level higher than the initial metallicities of the merging galaxies. In agreement with observations, our modeled major mergers fall below the mass-metallicity relation, and can explain the full range of circumnuclear metallicities observed in more violent mergers in the local (Rupke et al. 2008) or distant universe (Rodrigues et al. 2008).

Mark Dickinson (NOAO)

Observing Galaxy Assembly with Optical and Infrared Surveys (R1.2)

Optical and infrared surveys have mapped the history of galaxy evolution from the present day back to the first billion years of cosmic time. I will give a broad review of galaxy evolution as observed with surveys at optical, and (near-, mid- and far) infrared wavelengths, focusing on the history of star formation and galaxy stellar mass growth out to the highest accessible redshifts. I will highlight results from the latest deep field observations using the Hubble and Herschel space telescopes and other premier facilities.

Laurent Drissen (Université Laval)

SpIOMM and SITELLE: Wide-Field Hyperspectral Imagers for the Study of Galaxy Evolution (C3.7)

Carmelle Robert (Université Laval), Laurie Rousseau-Nepton (Université Laval), Anne-Pier Bernier (Université Laval), Simon Thibault (Université Laval), Frédéric Grandmont (ABB Bomem), et al.

SpIOMM, a wide-field Imaging Fourier Transform Spectrometer attached to the Mont

Mégantic 1.6-m telescope, is capable of obtaining the visible spectrum of every source of light in a 12 arcminute field of view, with a spectral resolution ranging from R = 1 (wide-band image) to R = 10 000, resulting in 1.7 million spectra with a spatial resolution of one arcsecond. SITELLE will be a similar instrument attached to the Canada-France-Hawaii telescope. We will present the result of our investigation of nearby galaxies with SpIOMM, as well as the expected performance and capabilities of SITELLE for the study of nearby and more distant galaxies.

Pierre-Alain Duc (AIM, CEA Paris Saclay)

Reconstructing the Mass Assembly of Early-Type Galaxies with Collisional Debris (C7.4)

Duc, P.-A (AIM, France); Ferriere, E. (AIM, France); Michel-Dansac L. (CRAL, France), Bournaud, F. (AIM, France), Ferrarese L. (UVIC, Canada) et al.

The mass assembly of galaxies leaves various imprints in their surroundings, such as shells, streams, tidal tails, extended halos, etc... The frequency and properties of these fine structures depend on the mechanism driving the mass assembly. Depending on whether massive galaxies were formed through a monolithic collapse, rapid cold-gas accretion followed by violent disk instabilities, minor mergers or major dry / wet mergers, the ubiquity of fine structures will go from none to significant. Therefore by studying the outskirts of galaxies, one can learn about their main formation mechanism. Most efforts in this direction have so far been done for very nearby spiral galaxies; because Early-Type Galaxies (ETGs) are the most powerful probes at low redshift of the hierarchical mass assembly of galaxies, they should exhibit even more fine structures than late type galaxies. I will present our on-going work to characterize the external parts of ETGs which relies on: - stunning extremely deep, wide-field, optical images obtained at CFHT of field and cluster ETGs obtained as part of the resp. ATLAS-3D end NGVS projects, which reveal a wealth of unknown faint structures at levels as faint as 29 mag/arcsec2. - state of the art numerical simulations of mergers, either idealized or made in cosmological context, which are used to interpret the observational data and constrain the mass assembly of galaxies.

Florence Durret (Institut d'Astrophysique de Paris)

Environmental Effects on Galaxy Luminosity Functions in Clusters (C1.5)

F. Durret 1, T. F. Lagana 2, C. Adami 3 1 Institut d'Astrophysique de Paris, CNRS, UMR~7095, 75014 Paris, France 2 IAG, USP, Sao Paulo/SP, Brazil 3 LAM, Pole de l'Etoile Site de Chateau-Gombert, 13388 Marseille, France

The formation and evolution of galaxies are known to be strongly influenced by environment. This can be observed in particular in clusters, where galaxy luminosity functions (GLFs) vary in shape with the dynamical state of the cluster (relaxed or in

various stages of merging), with the photometric band considered (blue or red) and with the position in the cluster. We propose to present here results concerning the GLFs in one relaxed and several merging clusters, based on deep imaging obtained with the CFHT in several bands. We will show that the correlation of these properties with temperature and metallicity maps of the hot X-ray intracluster gas derived from XMM-Newton data allows to trace the dynamical histories of clusters, and in some cases their relation with the galaxy distribution at very large scales.

Sara Ellison (University of Victoria)

Gas Flows in Galaxies: Mergers and Bars (C5.6)

Bars and galaxy-galaxy mergers represent the two main mechanisms for triggering gas inflows that lead to central star formation in galaxies. I will present a comparative study of these two mechanisms, which uses the star formation rates, and gas-phase metallicities measured in SDSS galaxies to probe the efficiency of gas flows.

Eric Emsellem (ESO)

3D Spectroscopic Surveys of Early-Type Galaxies (R3.1)

I'll review a few science topics, which are being specifically addressed by on-going surveys of nearby early-type galaxies via integral-field spectroscopy, focusing on e.g., the dynamical status and evolution of these systems.

Benoît Epinat (Laboratoire d'Astrophysique de Toulouse-Tarbes)

Spectroscopic Surveys: Exploring Galaxy Evolution Mechanisms (R4.2)

Massiv collaboration

We observed a sample of 50 high-redshift (1 le z le 1.8) galaxies with SINFONI as part of the MASSIV (Mass Assembly Survey with SINFONI in VVDS) survey. When completed, the MASSIV sample will be the largest spectro 3D sample (~80 galaxies) in this redshift range. The study of galaxy kinematics at high redshifts is a key to understand galaxy formation and evolution, in particular because it enables to see signatures of merging and/or interactions but also because it gives indications on the dynamical support and on the amount of matter (including the dark one) in the galaxies. We have performed a morpho-kinematical classification on these 50 galaxies that distinguish interacting systems from isolated ones, and rotating disks versus slowly rotating objects. I will present and discuss this classification scheme together with our results concerning the evolution of the Tully-Fisher relation. I will show how this sample/redshift ranges compares with other samples at lower and higher redshift. Recent numerical

simulations give some clues on the observational signatures of various galaxy formation processes such as cold flows along cosmic string or merging. The study of the dynamical support of gaseous disks is a strong signature to study the stabilization merging. The study of the dynamical support of gaseous disks is a strong signature to study the stabilization of disks. Interestingly and contrarily to higher redshift samples our sample shows that at this epoch, there is a significant fraction (around half the sample) of galaxies with low velocity dispersions and compatible with local disks. This is suggesting that the gaseous disks already began their stabilization around z~1.5.

Kambiz Fathi (Stockholm Observatory)

Scale Length of Disk Galaxies in the Local Universe (C9.6)

We have derived disk scale length for 30374 non-interacting disk galaxies in all five SDSS bands. Virtual Observatory methods and tools were used to define, retrieve, and analyze the images for this unprecedentedly large sample classified as disk/spiral galaxies in the LEDA catalogue. Cross-correlation of the SDSS sample with the LEDA catalogue allowed us to investigate the variation of the scale lengths for different types of disk/spiral galaxies. We further investigated asymmetry, concentration, and velocity dispersion as indicators of morphological type, and were able to assess how the scale length varies with respect to galaxy type. Here, we present the scale length derivation method and numerous tests that we have carried out to investigate the reliability of our results. The average r-band disk scale length is 3.79 kpc, with an RMS dispersion of 2.05 kpc, and that this is a typical value irrespective of passband and galaxy morphology, concentration, and asymmetry. The Freeman Law, distributions, and typical trends of scale lengths are discussed, and these results could be used to test the results of forthcoming cosmological simulations of galaxy formation and evolution of the Hubble sequence.

Bradley Frank (University of Cape Town)

Comparisons of HI and CO Dynamics of THINGS Galaxies (C2.8)

W.J.G. de Blok, (University of Cape Town)

We present recent results comparing the dynamics of a sample of 11 galaxies that have been observed in HI as part of the THINGS survey, and in CO by the HERACLES survey. We will also compare different means of computing velocity fields as well as the kinematics and rotation curves as derived from the CO and HI components in these galaxies. Additionally, we explore the kinematics of the innermost parts of the disk, where CO is abundant, but HI has a very low surface density.

Thiago Gonçalves (Caltech)

Lyman Break Analogs: Constraints on the Formation of Extreme Starbursts at Low and High Redshift (C4.6)

Lyman Break Analogs (LBAs), characterized by high far-UV luminosities and surface brightnesses as detected by GALEX, are intensely star-forming galaxies in the low-redshift universe (z~0.2), with star formation rates reaching up to 50 times that of the Milky Way. These objects present metallicities, morphologies and other physical properties similar to higher redshift Lyman Break Galaxies (LBGs), motivating the detailed study of LBAs as potential local analogs to this high-redshift galaxy population. We present results from our recent integral-field spectroscopy survey of LBAs with Keck/OSIRIS, which shows that these galaxies have the same nebular gas kinematic properties as high-redshift LBGs. We argue that such kinematic studies are not an appropriate diagnostic to rule out major merger events as the trigger for the observed starburst. Comparison between kinematic analysis and morphological indices from HST imaging disagree with respect to merger identification, with no correlation between the two methods. Artificial redshifting of our data indicates the merger detection rate is even worse at high redshift due to surface brightness dimming and resolution loss. Whether mergers could generate the observed kinematic properties is strongly dependent on gas fractions in these galaxies. We present preliminary results of a CARMA survey for LBAs and discuss the implications of the inferred molecular gas masses for formation models.

Edward Guinan (Villanova University / IAU TAD Program)

The IAU Teaching Astronomy for Development (IAU/TAD) Program: Focus on Africa (R6.3)

Larry Marschall (Gettysburg College)

I will discuss the Teaching Astronomy for Development (TAD) program of the International Astronomical Union (IAU). The IAU/TAD program was established a few decades ago within Commission 46 of the IAU. The IAU/TAD program provides aid and resources for the development of teaching, education and research in astronomy primarily in developing countries. Over the last ten years, IAU/TAD program has supported over twenty programs in Africa, Asia, Central America and the Caribbean, the Middle East, South East and West Asia, and South America. I will discuss planned and possible future IAU/TAD programs with a special emphasis on the development of Astronomy education and teaching in Africa. Information and advice will be provided on how to apply to the IAU/TAD program for assistance.

Hitoshi HANAMI (Iwate University)

Reconstruction of Star Formation and AGN Activities in Galaxies Classified with the Balmer Break, 1.6 μm Bump, and PAH Features up

to z=2 (C5.7)

We have studied the star forming and AGN activity of massive galaxies in the redshift range $z=0.5-2$, which are detected in a deep survey field using the AKARI and Subaru} telescopes toward the North Ecliptic Pole (NEP). The multi-wavelength survey (extending from the optical to Mid-InfraRed (MIR) wavelengths) allows us to select sub-populations of Balmer Break Galaxies (BBGs) in three redshift ranges of z=0.5-0.8, 0.8-1.2, and >1.2, with two colour criteria characterizing their redshifted Balmer 400 nm break. These can also be categorized into sub-populations of Infra-Red (IR) Bump Galaxies (IRBGs), which are classified into similar redshift intervals with the AKARI NIR colours detecting their redshifted 1.6 μm bump. For BBGs classified from ground-based optical/NIR photometry in each redshift interval, AKARI/IRC Mid-InfraRed (MIR) multiband photometry is used to trace their star-forming/AGN activity, with/without the Polycyclic-Aromatic Hydrocarbon (PAH) emission bands at 6.2, 7.7 and 11.3 μm. These data can be used to distinguish star forming populations from AGN dominated ones, and to estimate the derived Star Formation Rate (SFR) from their total emitting InfraRed (IR) luminosities. We have analysed the results for star-forming/AGN-harboring BBGs/IRBGs classified with the MIR colours, which we summarize below: 1) The rest-frame 7.7 μm luminosity is still a good tracer of the total IR (tIR) luminosity, as the PAH emission dominates for star-forming galaxies even up to z ~ 2$, 2) The SFR derived from total bolometric luminosity shows a correlation that is nearly proportional to the stellar mass M∗, appears more clearly than those of the extinction corrected UV star formation ratio SFR_UV;cor, even though the luminosity ratio of the total to the UV is basically consistent with an extrapolation from known dust extinction laws, 3) the IR-derived specific SFR (sSFR) per unit stellar mass rises with redshift at all stellar masses, 4) the sSFR are nearly constant, or show a weak dependence on stellar mass $M∗, 5) Super Massive Black Holes (SMBH) could already have grown to ~ 3 x 10^8 M_{\odot}$ in the most luminous population, with $10^{12}L_{\odot}$ and $10^{11} M_{\odot}$ in MIR selected AGNs at $z>1.2$, suggesting that the mass relation between the SMBH and its host has already become established by z ~ 1-2.

George Heald (ASTRON)

The WSRT HALOGAS Survey: Status and First Results (C2.4)

Gyula Jozsa (ASTRON), Paolo Serra (ASTRON), Laura Zschaechner (University of New Mexico), Richard Rand (University of New Mexico), Filippo Fraternali (Bologna University), Tom Oosterloo (ASTRON), Rene Walterbos (New Mexico State University), Renzo Sancisi (Osservatorio Astronomico di Bologna & Kapteyn Astronomical Institute), Eva Juette (Ruhr-Universitaet Bochum), and Gianfranco Gentile (Ghent University)

Cold gas accretion is believed to be an important mechanism for galaxies to maintain their star formation reservoir. To date, the galaxies, which have been observed to sufficient depth to find direct evidence for this process, are few, and were not selected for deep observations on independent grounds. Thus, the generic

characteristics of cold gas accretion in galaxies are still largely unknown. The WSRT Hydrogen Accretion in LOcal GAlaxieS (HALOGAS) Survey, now being conducted with the Westerbork Synthesis Radio Telescope (WSRT), aims at performing the first systematic investigation of cold gas accretion in nearby spiral galaxies. In the scope of this new WSRT survey, we observe a total of 24 nearby spiral galaxies with a wide spread in type, using an integration time of 120 hours per target. This is sufficient to detect the expected faint, neutral gas component in the outskirts of the target galaxies. To date, over 50 percent of the observations have been accomplished. I will describe the survey and present the first results based on detailed analyses of our completed observations. Compared to other HI surveys, we achieve a significantly better picture of the diffuse HI structure and its kinematics in the outskirts of the observed galaxies. The detected amount of anomalous gas, indicative of either gas accretion or a galactic fountain process, varies significantly from galaxy to galaxy. I will conclude by discussing the implications of these new observational results.

Olivier Hernandez (Laboratoire d'Astrophysique Expérimentale - Université de Montréal)

Tracing the Ancestry of Galaxies using 3D spectroscopy (C3.6)

Claude Carignan (Université de Montréal), Philippe Amram (Université de Provence), Jean-Luc Gach (LAM), Jacques Boulestiex (LAM)

An evolution of 3D spectroscopy through ages to understand galaxies at low redshift will be presented. 3D spectrography presents new challenges with the large number of 8-10m class telescopes and futur ELT. These telscopes reach fainter and more distant object and, by the way, new scientific programs. We will review here existing solutions and constrains.

Luis Ho (Carnegie Observatories)

The Carnegie-Irvine Nearby Galaxies Survey (C3.4)

The Carnegie-Irvine Nearby Galaxies Survey is a deep photometric and spectroscopic investigation of the 600 brightest galaxies in the southern hemisphere using facilities at Las Campanas Observatory. Here we present an overview of the survey and preliminary results on the photometric properties of the disk component, with emphasis on their light profile, deviations from an exponential profile at small and large radii, incidence of lopsidedness, and degree of non-axisymmetric perturbation.

Jonas Johansson (University of Portsmouth)

The Chemical Enrichment Histories of SDSS Galaxies (C5.5)

Daniel Thomas, Claudia Maraston

We derive the full chemical enrichment histories for SDSS galaxies using a large variety of abundance ratios, namely [C/Fe], [N/Fe], [O/Fe], [Mg/Fe], [Ca/Fe] and [Ti/Fe]. The sample consists of nearly 4000 quiescent early-type galaxies. We utilize stellar population models of absorption line indices that are an updated and flux-calibrated version of the models of Thomas et al. (2003) based on the MILES stellar library. Most importantly, the flux calibration of our new models makes the application of Lick offsets unnecessary. We confirm previous results of increasing age, [Z/H] and [alpha/Fe] with stellar velocity dispersion and galaxy mass. We derive similar trends for the elements [O/Fe], [Mg/Fe], [C/Fe] and [N/Fe]. On the contrary we find that Ca and Ti scale with Fe, hence there are no such correlations with galaxy mass for either [Ca/Fe] or [Ti/Fe]. This indicates that SNIa contribute more to the enrichment of heavy alpha-elements than previously thought. This puts strong constraints on supernova nucleosynthesis and models of galactic chemical evolution. Interestingly, we find no correlations with environment for any of the element abundance ratios. This is in disagreement with previous studies that found indications for over-abundances of N and C in low-density environments and poses tight constrains to the formation histories of massive elliptical galaxies.

Gyula I. G. Jozsa (ASTRON - NWO)

Warps and Accretion (C2.7)

Warps are a basic feature of disk galaxies. Usually they occur at radii where the optical disk fades and become most pronounced in the outermost gaseous disks. As such, warps present a massive reservoir to replenish star forming material in the inner, star forming disks. Furthermore, some possible excitation mechanisms for warps connect their formation to the accretion of extragalactic material. Interactions or mergers with gas-rich companions or the direct accretion of the ambient intergalactic medium might lead to the formation of warps, at the same time supplementing fuel to maintain star formation. I will present a number of HI studies of warped galaxies, including ultra deep observations of the prototype warped galaxies NGC 5907 and NGC 4013, to discuss whether the observed kinematics show evidence for a connection of warps and accretion of gas from the ambient medium.

Shinya Komugi (ISAS / JAXA)

The AKARI Far-Infrared All-Sky Survey Image : Dust Properties of Galaxies in the Local Universe (C1.3)

Yasuo Doi (University of Tokyo), and AKARI Team

The Japanese infrared satellite AKARI surveyed over 94% of the sky during its Helium cooled phase from Feb. 2006 to Aug. 2007. The far infrared band from 50-180um was covered continuously by 4 bands at 65um, 90um, 140um, and 160um with angular

resolution of 40-60". It is the first high-resolution all-sky survey longwards of 100um. The first point source catalogue was publicly released in March 2010. The internal release of the all-sky map is scheduled in July 2010, with a detection limit of 10-30 MJy/sr and flux calibration uncertainty of better than 50%. In this presentation we will show examples of nearby galaxies observed in the survey, along with a demonstration of how well physical properties (i.e., temperature) can be derived using this fundamental dataset.

Nario Kuno (Nobeyama Radio Observatory)

NRO Legacy Project: M33 all Disk Survey of Giant Molecular Clouds with NRO 45-m and ASTE 10-m Telescopes (C2.6)

T. Tosaki(Joetsu University of Education), S. Onodera (Nobeyama Radio Observatory) et al.

We have conducted all disk imaging of M33 in 12CO(1-0) using the 45-m telescope at Nobeyama Radio Observatory. The spatial resolution of ~80 pc is comparable to the size of GMCs. The identified GMCs show wide variety in star forming activity. The variety can be regarded as the difference of the evolutionary stage of GMCs. We found that Kennicutt-Schmidt law breaks in GMC scale (~80 pc), although it is still valid in 1 kpc scale. We also made partial mapping in 13CO(1-0) with the 45-m telescope and 12CO(3-2) with ASTE telescope. These data show that the variation of physical properties of molecular gas along with the GMC evolution and mass. That is, GMCs with more active star formation and more mass tend to have higher fraction of dense gas. We obtained a wide and deep 1.1 mm continuum map with ASTE and multi-color optical images with SUBARU. These data will also be used to compare with the CO data to trace the evolutionary process of GMCs.

Olivier Le Fevre (Laboratoire d'Astrophysique de Marseille)

Large High Redshift Spectroscopic Surveys (R4.1)

Spectroscopic redshift surveys allow assembling unbiased samples, from which statistically robust galaxy population studies can be conducted. Unbiased samples are necessary to search for the progenitors of local galaxies to derive a meaningful evolution scenario. Furthermore, spectroscopic surveys allow selecting well-defined sub-samples for 3D kinematical surveys. I will review the current status of deep surveys, based on the recent results with the VIMOS spectrograph on the VLT.

Loic Le Tiran (GEPI - Observatoire de Paris)

The Turbulent ISM of Galaxies about 10 Gyrs ago: an Impact on their IMF? (C4.7)

Lehnert Matt - GEPI - Observatoire de Paris

I will present observations of 10 massive galaxies as seen as they were 9 Gyrs ago with the integral-field spectroscopy using SINFONI from the ESO-VLT, combined with data obtained from the DEEP2 Survey. I will first paint a brief picture of the physical conditions at work in these galaxies : they exhibit complex morphologies, high star formation and are so pressure dominated they are likely to drive winds. Moreover, their ratio of Hα to FUV flux to R-band luminosity surface brightnesses indicates that perhaps their initial mass function is flatter than Salpeter at the high mass end, as has been suggested recently for some local galaxies. It may be that high turbulence is responsible for skewing the IMF towards more mass stars as has been suggested by some theories of star-formation.

Roberto Maiolino (Astronomical Observatory of Rome)

The Metallicity Evolution of Galaxies through the Cosmic Epochs (C5.4)

The metallicity of local galaxies follows a well defined relationship with stellar mass and star formation rate. Based on data from optical and near-IR spectroscopic surveys, such relationship does not appear to evolve out to z~2, while significant evolution is observed at z>3. The lack of evolution of the metallicity-mass-SFR relation out to z~2 suggests that the same fundamental mechanism of galaxy formation is at work through the different cosmic epochs, at least within the redshift interval 0<2. However, one of the main caveats of past studies is that both SFR and metallicity measurements are based on optical tracers, which are affected by dust extinction. The Herschel Space Observatory offers for the first time the possibility of both measuring the SFR in high-z galaxies through their FIR emission and to also measure their dust mass, which is an alternative tool to measure their content of metals. Early Herschel results have shown that the "true" SFR (i.e. FIR-based) of several high-z galaxies can be significantly different relative to the SFR inferred from optical-UV tracers, depending on the galaxy type. Moreover, the large dust content detected in several high-z galaxies indicates a metallicity much higher than inferred from optical diagnostics. By using the extensive Herschel surveys performed within the GTO over the main extragalactic fields (mostly GOODS and COSMOS) I will re-assess the evolution of the metallicity-mass-SFR relation for different classes of galaxies at different redshifts. The implications for galaxy formation scenarios will be discussed.

Claudia Maraston (University of Portsmouth)

Stellar Populations at High Redshift (R5.1)

The availability of sophisticated observational technologies in present times and the cooperation between different observatories worldwide is allowing astrophysicists to gain an unprecedented view over the stellar population of galaxies at high redshift, just when the ancestors of present-day galaxies were showing off. The physical interpretation of their light emission is based upon stellar population models, especially their characteristics in the low-age regime. I shall review the state-of-the art of stellar population studies in the high-redshift Universe as a function of redshift, discussing robustness and intrinsic uncertainties taking a model perspective.

Hugo Martel (Université Laval)

Chemical Signature of Gas-Rich Disc-Disc Mergers at High Redshift (C7.8)

Simon Richard (Université Laval), Chris Brook (University of Central Lancashire), Daisuke Kawata (University College London), Brad Gibson (University of Central Lancashire), Patricia Sanchez-Blazquez (Instituto de Astrofisica de Canarias)

We used an SPH algorithm, with a detailed treatment of star formation, supernovae feedback, and chemical enrichment, to perform simulations of mergers between gas-rich disc galaxies. These simulations result in the formation of a remnant with disc morphology. Stars formed by a starburst during the merger, and stars formed after the mergers have different kinematical and chemical properties. The first ones are located in a thick disc or in the halo. They are partially supported by velocity dispersion and have high [alpha/Fe] ratios even at metallicities as high as [Fe/H]=-0.5. Stars formed later are located in a thin, rotationally supported disc, and have lower [alpha/Fe] ratios. We find that, while the kinematic and structural properties of the merger remnant depend strongly upon the orbital parameters of the mergers, there is a remarkable uniformity in the chemical properties of the mergers. This suggests that general conclusions about the chemical signature of gas-rich mergers can be drawn.

Christopher Martin (California Institute of Technology)

Exploring Galaxy Evolution with GALEX UV Surveys (R1.1)

GALEX Science Team

The Galaxy Evolution Explorer (GALEX) continues its surveys of the ultraviolet sky. GALEX surveys have supported the following galaxy evolution investigations: calibrating UV as a star formation rate tracer, using wide and deep surveys to

measure star formation history, studying the evolution of dust extinction and metallicity, selecting and analyzing galaxies in transitory states, finding local analogs to Lyman Break Galaxies, probing and time-dating star formation in a wide variety of physical regimes. Our continuing mission is focussed on relating star formation history and galaxy evolution paths to the properties of dark matter halos and their assembly history, and on beginning to relate the evolution of galaxies to that of black holes and the intergalactic medium. GALEX has proven that the UV is an ideal band to find and map star formation in low mass, low-density objects, and potentially in primordial gas. With future UV missions it may be possible to map emission from the intergalactic and circum-galactic medium, and make a definitive connection between galaxy evolution and the cooling, accretion, heating, and enrichment of gas in the cosmic web.

George Miley (Leiden Observatory)

The IAU Strategic Plan: Astronomy for the Developing World (R6.1)

Claude Carignan (Université de Ouagadougou) & Kevin Govender (OAD)

Astronomy for Capacity Building Astronomy is a unique tool for capacity building because it combines cutting-edge technology with fundamental science and profound cultural roots. Building on the success of the International Year of Astronomy, the International Astronomical Union has developed an ambitious decadal plan "Astronomy for the Developing World". The goal of this plan is to use astronomy to stimulate development globally. Africa is a priority region for the plan. The IAU has selected the South African Astronomical Observatory to host the international office that will coordinate the program. I shall describe the rationale for the plan, outline its vision and strategy, summarize some of the planned activities and give an update on the timeline.

Pheneas Nkundabakura (Kigali Institute of Education)

Unveiling the Nature of two Unidentified Blazar Candidates Through Spectroscopic Observations (C4.8)

P.J. Meintjes, University of the Free State, Physics Department, P.O. Box 339, Bloemfontein, 9300, SA

We present results from a multiwavelength follow-up of two EGRET sources, 3EG J0821-5814 and 3EG J0706-3837, selected among the unidentified EGRET sources based on their similarities with BL lacs in their broadband properties. These sources are associated with radio counterparts PKS J0820-5705 and PMNJ0710-3850. Recent spectroscopic observations using the SOAR/Goodman spectrograph at Cerro Tololo Inter-American Observatory (CTIO) in Chile reveal that 3EG J0821-5705 is a radio-loud AGN with redshift z= 0.06 while 3EG J0710-3837 is a Seyfert I galaxy of z= 0.129. The observed Ca K & H lines depression ratio at 4000 Å was used to assess the presence of

a non-thermal component from the nuclei in these sources and PKS J0821-5705 shows distinct blazar-like features in its multiwavelength emission properties.

Hakeem Oluseyi (Florida Institute of Technology)

Galactic Archaeology Using RR Lyrae Stars Observed by the LSST (C8.8)

Andrew C. Becker (University of Washington), C. Culliton (University of Pennsylvania), M. Furqan (U.S. Navy), K.L. Hoadley (Florida Institute of Technology), P. Regencia (Florida Institute of Technology), A.J. Wells (Florida Institute of Technology), J.I. Allison (Alabama A&M University), S. Jacoby (LSST Corporation), R.L. Jones (University of Washington), K.S. Krughoff (University of Washington), B. Sesar (University of Washington)

The Large Synoptic Survey Telescope (LSST) is an 8.4-meter aperture telescope with a 9.6 degree-square field of view and a 3.2 Gigapixel camera that will image the available sky every three days for 10 years. We have investigated the LSST's ability to recover the pulsational periods, flux averaged magnitudes, and light curve shapes of RR Lyrae stars, which are a useful tracer population of galactic structure. A LSST simulation tool was used to sample ugriz RR Lyrae lightcurves observed in the Sloan Digital Sky Survey's "Stripe 82". The simulation tool returned each lightcurve as it would have been sampled by LSST, including realistic limiting magnitudes and photometric scatter based on historic seeing and weather data at the LSST site. I will report on the LSST's capabilities for mapping the Milky Way's history of galactic mergers, thus placing strong constraints on galaxy formation models; for discovering new dwarf galaxies in the Milky Way halo and beyond, addressing the "missing satellites" problem; and for mapping the halos of local group galaxies, again helping to elucidate the processes involved in galaxy formation and evolution, and Lambda-CDM cosmology.

Bruce Partridge (Haverford College)

What Radio Astronomy Can Tell us about Galaxy Formation (C9.5)

Radio astronomy, broadly interpreted, has made important contributions to the study of galaxy formation and evolution. Maps of the cosmic microwave background provide information on the seeds of large scale structure, in addition to refined values of the cosmological parameters. Radio luminosity tracks star formation rates well, and is not affected by dust obscuration as optical/uv observations are. Molecular line observations now permit purely "radio" redshift determinations. Depending on what other speakers and presenters cover, I will review some of these and related topics, and thus try to provide a positive answer to the implied question in my title.

Isabel Perez (Universidad de Granada)

Tracing the Origin of Bars and Bulges through the Study of their Stellar and Ionized Gas Properties (C5.3)

Patricia Sanchez-Blazquez (Universidad Autonoma de Madrid, Spain) Almudena Zurita (Universidad de Granada, Spain) Estrella Florido (Universidad de Granada, Spain)

Detailed analysis of the stellar populations in the bar region of local galaxies can shed some light on the formation and evolution of bars and bulges. Stellar age and metallicity distribution as well as the properties of the ionised gas within these regions provide a powerful link between a galaxy's star formation history and the dynamical processes operating within. They can give us 'archeological' clues as to the formation and evolution of the bar and to explore its influence on bulge formation and chemical redistribution in the disk.
We present the results on the derived stellar parameters for intermediate age populations, traced by Lick/IDS indices along the bar and bulge for a sample of 20 nearby galaxies, as well as a detail comparison between the properties of bulges in galaxies with and without a bar. We extend our study to the analysis of the properties of the current and recent (< 1 Gyr) star formation for the sample galaxies as traced by optical nebular line diagnostics.

D.J. Pisano (West Virginia University)

The Evolution of Luminous Compact Blue Galaxies: Disks or Spheroids? (C8.5)

C. Garland (Castleton State College), K. Rabidoux (WVU), R. Guzman (Florida), J. Perez-Gallego (Florida), F.J. Castander (IEEC-Barcelona)

Luminous compact blue galaxies (LCBGs) are a diverse class of galaxies characterized by high luminosity, blue color, and high surface brightness. While they were relatively common at a redshift of one, and contribute a significant fraction to the star formation rate density at the time, today they are a factor of ten rarer and contribute negligibly to the star formation rate density. As such, they are one of the most rapidly evolving populations of galaxies in the Universe. Given their location at the high luminosity, high mass tip of the blue sequence, LCBGs sit at the critical juncture of galaxies that are evolving from the blue to the red sequence. As part of our multi-wavelength survey of the local LCBGs, we have been using the VLA and GMRT to map a sample of LCBGs in HI 21 cm emission to study their kinematics. Our goal is to determine if single-dish HI observations represent a true measure of the dynamical mass of LCBGs and to look for signatures of recent interactions that may be triggering star formation in LCBGs. Our data show that while some LCBGs are in an ongoing interaction, many appear isolated. While all LCBGs contain HI and show signatures of rotation, the population does not lie on the Tully-Fisher relation nor can it evolve onto it. Furthermore, the HI maps of many LCBGs show signatures of dynamically hot components, suggesting that we are seeing the formation of a thick

disk or spheroid in at least some LCBGs. There is good agreement between the HI and Hα kinematics for LCBGs, and both are similar in appearance to the Hα kinematics of high redshift star-forming galaxies. Our combined data suggest that star formation in LCBGs is primarily quenched by virial heating, consistent with model predictions.

Leila Powell (CEA-Saclay)

The Impact of ISM Turbulence, Clustered Star Formation and Feedback on Galaxy Mass Assembly through Cold Flows and Mergers (C7.3)

Frederic Bournaud (CEA-Saclay), Julien Devriendt (Oxford), Adrianne Slyz (Oxford), Romain Teyssier (CEA-Saclay/ITP Zurich)

We investigate how simulating the interstellar medium (ISM) more realistically (by replacing the usual subgrid modeling with a direct treatment of the turbulent, multiphase ISM) can impact the key phases of galaxy formation. We study the cosmological mass assembly of a disc-galaxy at very high redshift and idealized models of mergers at z~2 and 0. Our simulations are among the first to reach the extreme temperature and density contrasts required to capture the very dense Giant Molecular Clouds (GMCs) in which star formation occurs. We can even resolve the internal density distribution and turbulent support of GMCs, owing to parsec-scale resolution and cooling models down to ~100K. We examine the effect of the interplay between cold filamentary accretion and a galactic wind on the very high-redshift assembly of a Milky Way-like galaxy. Due to the combined action of supernovae in the main galaxy and its satellites, a wind that extends well beyond the virial radius develops. This results in the halo being filled with hot gas even though there is no virial shock (as is the case in more massive galaxies). The mass inflow rate via the filaments is not diminished, however, suggesting that cold flows penetrating a hot medium could also be an important phase during the assembly of moderate mass galaxies. This potentially explains why outflows (not inflows) are most frequently detected in high-redshift galaxies (Steidel et al.). Mergers are another important mechanism for mass assembly. Clustered star formation in a cloudy ISM results in a more extended starburst that can occur earlier in the course of a merger. In the case of high-redshift mergers, this can result in remarkably compact early-type galaxies.

Mathieu Puech (GEPI - Observatoire de Paris)

The Evolution of the Baryonic Tully-Fisher Relation over the past 6 Gyr (C4.4)

Hammer, Flores et al. GEPI Observatoire de Paris

Scaling relations are salient ingredients of galaxy evolution and formation models. In this talk, I will present results from the IMAGES survey, which combines spatially-resolved kinematics from FLAMES/GIRAFFE with imaging from HST/ACS and other

facilities. Specifically, I will focus on the evolution of the stellar mass and baryonic Tully-Fisher Relations (TFR) from z=0.6 down to z=0. We found a significant evolution in zero point and scatter of the stellar mass TFR compared to the local Universe. Combined with gas fractions derived by inverting the Schmidt-Kennicutt relation, we derived for the first time a baryonic TFR at high redshift. Conversely to the stellar mass TFR, the baryonic relation does not appear to evolve in zero point, which suggests that most of the reservoir of gas converted into stars over the past 6 Gyr was already gravitationally bound to galaxies at z=0.6.

Carmelle Robert (Université Laval)

The Study of Barred Spiral Galaxies with IFUs (C3.5)

Carmelle Robert, Simon Cantin, Élaine Brière, Laurie Rousseau-Nepton, & Laurent Drissen Université Laval, Département de physique, de génie physique et d'optique, and Centre de recherche en astrophysique du Québec, Québec, QC G1V 0A6, Canada

We used the Integral-Field Units SpIOMM and OASIS to describe the morphology of numerous continuum and line wavebands, and to characterize the gas and stellar populations of a sample of SB galaxies (some of which known as starburst or LINER). The central region of these galaxies was best studied with OASIS and an iterative technique developed to separate superposed stellar populations. In most objects, we see the young populations located in nuclear structures (spot, bar, or spiral), in relation with the galaxy large-scale bar. The old stellar component is mostly uniformly distributed. The mass distribution of the different populations indicates a long sequence of burst events over the whole galactic history. A significant activity (composite/transition region or LINER) in some of the "quiet" galaxies in the sample also show up. A few objects give peculiar NII/Halpha ratio all over the central galaxy region. SpIOMM was used to map the emission lines over the whole visible disk of one of these galaxies (NGC5430). It confirmed the peculiar line ratio and also revealed a bimodal age distribution for the HII regions.

Margarita Rosado (IA-UNAM)

Dynamics of Interacting Galaxies (C7.7)

Ruslan Gabbasov, Paolo Repetto (IA-UNAM), Isaura Fuentes-Carrera (ESFM-IPN)

The simplest systems of interacting galaxies are the isolated galaxy pairs. We analyze several isolated pairs of galaxies by confronting their observed kinematics with N-body plus gas numerical simulations in order to study their secular evolution as well as the change in dark matter distribution due to interactions. This is done by means of Fabry-Perot kinematics and the use of gadget-2 numerical code.

Patricia Sanchez-Blazquez (Universidad Autonoma de Madrid)

Quantifying the Redistribution of Mass and Angular Momentum in the Galactic Disks due to Bars (C7.5)

Pierre Ocvirk (Strasbourg Obsevatory); Reynier Peletier (Kapteyn institute);Isabel Perez (Universidad de Granada)

Numerical simulations have shown that strong gravitational torque by non-axisymmetric components induce evolutionary processes such as redistribution of mass and angular momentum in the galactic disks and consequent change of chemical abundance profiles. If we hope to understand chemical evolution gradients and their evolution we must understand the secular processes and re-arrangement of material by nonaxisymmetric components and vice-versa. The most obvious of these aforementioned non-axisymmetric components are bars - at least 2/3 of spiral galaxies host a bar, and possibly all disk galaxies have hosted a bar at some point in their evolution. While observationally it has been found that barred galaxies have shallower gas-phase metallicity gradients than non-barred galaxies, a complementary analysis of the stellar abundance profiles has not yet been undertaken. This is unfortunate because the study of both gas and stars is important in providing a complete picture, as the two components undergo (and suffer from) very different evolutionary process. The study of both, stellar+gaseous abundance provide clues concerning the temporal evolution of the gradients: stellar abundances are archaeological clues as to the formation and evolution of the disk, while the gas gives a snap-shot of the present day abundances. We present here a study of the gas and stellar metallicity distributions in a sample of barred and non-barred galaxies using 2D spectroscopic observations.

Ruben Sanchez-Janssen (ESO)

AVOCADO: A Virtual Observatory Census to Address Dwarfs Origins (C6.6)

Dwarf galaxies are by far the most abundant of all galaxy types, yet their properties are still poorly understood --especially due to the observational challenge that their intrinsic faintness represents. AVOCADO aims at establishing firm conclusions on their formation and evolution by constructing a homogeneous, multiwavelength dataset for a statistically significant sample of several thousand nearby dwarfs ($-18 < Mi < -14$). Using public data and VO tools, we have built GALEX+SDSS+2MASS spectral energy distributions (SEDs) that are fitted by a library of single stellar population models. Star formation rates, stellar masses, ages and metallicities are further complemented with structural parameters that can be used to classify them morphologically. This unique dataset, coupled with a detailed characterization of each dwarf's environment, allows for a fully comprehensive investigation of his or her origins and to track the (potential) evolutionary paths between the different dwarf types.

Marcin Sawicki (Saint Mary's University)

The Build-up of Stellar Mass in High-Redshift Galaxies (C8.4)

We probe deep into the high-z galaxy population to study how galaxies build up their stellar populations. We find that star formation rates - particularly in galaxies below the luminosity function knee at L* - show a strong correlation with galaxy stellar mass. This correlation suggests that star formation in these low-mass objects is fueled by ongoing accretion of material into their dark halos. We also find that the star formation rate in the most massive haloes in our sample declines with redshift, so that while ~10^12Msun halos at z~3 and 4 are host to >50 Msun/yr of star formation, at z~2.2 they produce ~20 Msun/yr, and at z~1.7 only ~2 Msun/yr. We interpret this as shut-down of star formation in the most massive halos and evidence that galaxy downsizing is related not just to galaxy stellar masses, but to the masses of the dark matter halos that host them.

David Schade (Canadian Astronomy Data Centre)

The Post-Virtual Observatory World View (R6.4)

The Virtual Observatory movement is approaching a decade of life and the developments of the IVOA and VO in general will gradually become integrated into the infrastructure environment that is seen by research astronomers. How will the Post-VO world look from a science users point of view? How will it look from the point of view of data curators and data producers? What follows after the Virtual Observatory?

Joe Silk (Oxford University)

The Role of Feedback in Baryon Acquisition (R8.2)

Feedback plays a crucial role in determining the galaxy luminosity function and the specific star formation rate of high redshift galaxies, as well as in downsizing. I will review the various incarnations of feedback in disk and spheroidal galaxy formation.

Christian Surace (Laboratoire d'Astrophysique de Marseille)

The Virtual Observatory: Data, Standards and Tools (R6.5)

The virtual Observatory has made available data all over the world. From the standards definitions to the tool developments, the talk will focus on the technics used to exploit the astrophysical outputs. This review will present the state of the art of the VO tools and will answer questions like : what kind of data are accessible, how to deal with these data and how to extract the astrophysical information.

Lidia Tasca (Laboratoire d'Astrophysique de Marseille)

Where is the Light? Evolution of Bulges and Disks since z~0.8 (C8.3)

I will present the first results of our analysis of the light evolution in galactic bulges and disks and on their environmental dependence. This is possible due to using the final zCOSMOS-bright sample of roughly 20.0000 galaxies with spectroscopic redshift, HST/ACS imaging and multi-wavelength information. We therefore have an accurate estimate of galaxy environment, physical properties and morphology. I will discuss the importance of studying the chronology of bulge and disk formation, by analysing the relative contributions of these two components at different cosmological epochs, to shade some light in understanding the formation and evolution of galaxies.

Abiy Tekola (University of Cape Town)

The Environments of Local Luminous Infrared Galaxies (LIRGs) and their Star Formation Density Relationship (C5.8)

Andreas Berlind, Petri Vaisanen

(Ultra) luminous infrared galaxies ((U)LIRGs) are galaxies with infrared luminosity (L8-1000μm), $\log(LIR/L\Theta) \geq 11$. Almost all the local (U)LIRGs are advanced major disc galaxy mergers. It is believed that (U)LIRGS evolve into elliptical galaxies through merger-induced dissipative collapse and thus, in the context of this assumption, it is natural to expect (U)LIRGs and ellitptical galaxies to live in the same environments. The environments of local (U)LIRGs have not been investigated much and, as a result, very little is known about them. The few studies that have been done, which are limited by lack of completeness, favour the idea that (U)LIRGs do not live in clusters. In this work, we investigate the environments of (U)LIRGs in comparison to the environments of other types of galaxies with the same luminosity to see the difference in environment and the implication on their evolution. We measure the galaxy density in 2Mpc radius and 10Mpc length cylinder around galaxies with $\log(LIR/L\Theta) \geq 8.5$ drawn from the IRAS sample. We find that the density around these galaxies stays constant with luminosity up to $\log(LIR/L\Theta) = 11$ and increases with luminosity at higher $\log(LIR/L\Theta)$. Taking LIR as star formation indicator, this finding implies the reversal of star formation and density relationship at local Universe.

Brent Tully (University of Hawai'i)

Cosmic Flows (C8.7)

Helene Courtois, Univ. Lyon I

The measurement of accurate distances permits the construction of detailed 3D maps of the distribution and peculiar velocities of galaxies. The Cosmic Flows program involves optical/infrared photometric imaging and radio HI observations of a sample of several thousand galaxies and the subsequent determination of distances through the correlation between galaxy luminosity and rotation rate. Tremendous progress has been made recently and new results will be presented.

Petri Vaisanen (South African Astronomical Observatory)

African Eyes on the Sky - the Southern African Large Telescope (C3.8)

A 10-metre class telescope project on African soil is ending its commissioning period and is transitioning to science mode. I will present the current status of the SALT project, the telescope and its instruments. I will also show early science highlights, and discuss the SALT capabilities for extragalactic astronomy in particular.

Jacqueline van Gorkom (Columbia University)

Gas and Galaxy Evolution in the Local Universe (R2.1)

Our understanding of the formation and evolution of galaxies and their large scale structure has advanced enormously over the last decade, thanks to an impressive synergy between theoretical and observational efforts. While the development of the dark matter component seems well understood, the physics of the gas, during its accretion, removal and/or depletion is less well understood. Increasingly large scale optical surveys are tracing out the cosmic web of filaments and voids. Mathematical tools have been developed to describe these structures and to identify galaxies located in specific environments. I will review results of large single dish and smaller imaging surveys in neutral hydrogen in the context of large scale structure and ask: how do galaxies get and lose their gas. Although current HI emission surveys are mostly limited to redshifts less than 0.2, this is where the LSS is defined best and much can be learned in the local universe.

Simon White (Max Planck Institute for Astrophysics - Garching)

Simulating the Evolution of the Galaxy Population (R7.1)

The LCDM cosmogony is now well enough tested to be be considered a standard model for cosmic structure formation. Its predictions for structure at recombination have been tested by CMB observations to high precision down to the scales responsible for building large galaxies. Galaxy surveys and gravitational lensing observations test its predictions on large scales and for the nonlinear dark matter distribution around

galaxies, respectively. Lyman alpha forest observations confirm its predictions down to the scales responsible for making dwarf galaxies. This cosmogony makes detailed predictions for the efficiency and timing of galaxy formation, which are now being directly tested through observation. These are not consistent with current simulations of the galaxy formation process.

Abstracts – Poster Presentations

Babagana Abubakar (Kanuri Development Association)

The Position of the Moon, Sun, Stars and Space Sciences in Africa (P1)

A.K.J. Tijjani Wakil, Dungus Mohammed, Babagana Rufai

The Moon, the Stars and the Sun in some extent even the Clouds in the Sky are regarded as sacred or gods by some African traditional religions which are at present in control of approximately 25% of the entire African population of approximately 900 million as at 2009.In this respect the followers of these traditional religions are there for restricted from studying the Moon, Sun, Stars or any other object above the atmosphere or the astronomy. How ever the religion of Islam and Christianity which are collectively in control of 70% of the African population have not restricted their followers from studying the Moon, Sun, Stars or the Astronomy, but however due to the presence of elements of astrology in the space sciences generally, which is a branch of studies many Africans use locally through studying the movements of Stars in the prediction of future events or in fortune telling businesses made the Space Sciences generally to be less attractive to both the Muslims and the Christians in Africa, hence this situation is making many young promising potential future astronomers, aerospace engineers, climatologist, metrologies or the astrologists in their early education (primary or secondary/high schools) end up studying non space sciences related courses in their University levels. Hence this situation has lead to the underdevelopment of the space sciences generally in Africa and which also has the potential of under developing the future of space sciences at the global level too over time. In view of the above and in order to expand the development of space sciences as a whole the under listed suggestions/recommendations were proffered which if adopted and implemented it will enhance the development of the space sciences at all levels; 1. Major stake holders in the space sciences like the United Nations Organization of the Outer Space Affairs (UNOOSA), National Aeronautic Space Agency (NASA), European Space Agency (ESA) and many others should be helping in sponsoring and organizing Public enlightenment conferences, workshops, seminars or capacity building programs in Africa with the aim of developing the space sciences on the continent. 2. Religious scholars especially the Muslim, Christian and the African traditional religious scholars should be included in the capacity development programs towards developing the space sciences in Africa. 3. The international Space Organizations, especially those organizations that have excel or at the peak of the modern space sciences like the NASA, ESA and others should open their offices and possibly training institutes in Africa. 4. The international space organizations like the NASA, ESA and even the UNOOSA should be given scholarships to identified future space scientists in Africa that may not likely get the financial support to study the space sciences at the University level. 5. Papers and Abstracts coming from Africa should be given priority by organizers of conferences, workshops or seminars on the ground that many papers coming from Africa are towards developing the space sciences instead of being highly technical papers in this field of science, because the space sciences itself is not yet developed or recognized on the continent. In conclusion the author thinks that religious believes will continue to under develop or even restrict the studies of space sciences in Africa or even globally over time, unless if the above listed suggestions/recommendations are adopted and implemented other wise the rate at which the space sciences will continue to under develop will ever be on the increase.

Simon Anguma Katrini (Mbarara University of Science & Technology)

Developing Astronomy in Uganda (P2)

Edward Jurua

Astronomy as a discipline has not been widely established in Uganda. Aspects of astronomy, especially, the solar system, have been integrated in geography syllabii for secondary and tertiary institutions. The benefits astronomy owes to humanity are immense and therefore, efforts should be geared towards establishing astronomy as an autonomous discipline across the entire school system in the country. So far the urge and efforts made to popularize the discipline in Uganda have started yielding tangible results. This paper presents the achievements and future strategies of establishing astronomy in the Uganda's school system.

Claude Carignan (Université de Ouagadougou & Université de Montréal)

Astrophysics in Burkina Faso (P3)

Jean Koulidiati (Université de Ouagadougou), Luc Turbide (Université de Montréal)

On the African continent, most of the activities in Astronomy are found in South Africa where full training in Astrophysics is given in a few Universities and where most of the professional astronomers and of the research instruments (from small telescopes to the 11m SALT, in the Optical) can be found. In 2007, we have started a full program (undergraduate and graduate) in Astrophysics at the University of Ouagadougou have started a full program (undergraduate and graduate) in Astrophysics at the University of Ouagadougou and a small Observatory (ODAUO), for teaching purposes, was also built. In October 2009, we have put incrates the 1m Marly telescope in La Silla, Chile which will be rebuilt in 2011, as a full research telescope, on mount Djaogari in Burkina Faso.

Ana Chies Santos (Astronomical Institute Utrecht)

Ages of Globular Cluster Systems Related to Galaxy Morphology (P4)

S. S. Larsen (Utrecht), P. Anders (Utrecht), E. M Wehner (McMaster), H. Kuntschner (ESO), J. Strader (Harvard CfA), J. P. Brodie(UCO/Lick) and J. F. C. Santos Jr. (UFMG)

Some photometric studies of globular cluster (GC) systems using the optical/near-infrared colour combination have suggested the presence of a great fraction of

intermediate-age (2-8 Gyrs) GCs in apparently normal elliptical galaxies with old stellar populations, such as NGC 4365. Using homogeneously derived K-band LIRIS/WHT and archival g and z ACS/HST photometry, we investigate the age distributions of GC systems in 14 E/S0 galaxies. Without relying on SSP models, we perform a relative comparison between the different GC systems quantifying relative age differences. The age distribution of GCs in NGC 4365 appears to be similar to that of other large ellipticals, like NGC 4486 and NGC 4649. We find a correlation between the morphological type of a galaxy and its mean relative GC system age. Galaxies with simple morphology such as E0s, E1s and E2s seem to have on average genuinely old clusters whereas S0s have younger GC systems. Surprisingly, this appears to be driven by the more metal-poor clusters. I will discuss the implications of this finding to the formation/assembly of GC systems and their host galaxies.

Christopher Conselice (U. of Nottingham)

Clustering properties of galaxies selected in stellar mass: breaking down the link between luminous and dark matter in massive galaxies from z = 0 to z = 2 (P5)

Sebastian Foucaud

We present a study on the clustering of a stellar mass selected sample of 18482 galaxies with stellar masses M* > 10**10 Msolar at redshifts 0.4 < z < 2.0, taken from the Palomar Observatory Wide-field Infrared Survey. We examine the clustering properties of these stellar mass selected samples as a function of redshift and stellar mass, and discuss the implications of measured clustering strengths in terms of their likely halo masses. We find that galaxies with high stellar masses have a progressively higher clustering strength, and amplitude, than galaxies with lower stellar masses. We also find that galaxies within a fixed stellar mass range have a higher clustering strength at higher redshifts. We furthermore use our measured clustering strengths, combined with models from Mo & White, to determine the average total masses of the dark matter haloes hosting these galaxies. We conclude that for all galaxies in our sample the stellar-mass-to total- mass ratio is always lower than the universal baryonic mass fraction. Using our results, and a compilation from the literature, we furthermore show that there is a strong correlation between stellarmass- to-total-mass ratio and derived halo masses for central galaxies, such that more massive haloes contain a lower fraction of their mass in the form of stars over our entire redshift range. For central galaxies in haloes with masses Mhalo > 10^13 1/h Msolar, we find that this ratio is <0.02, much lower than the universal baryonic mass fraction. We show that the remaining baryonic mass is included partially in stars within satellite galaxies in these haloes, and as diffuse hot and warm gas. We also find that, at a fixed stellar mass, the stellar-to-total-mass ratio increases at lower redshifts. This suggests that galaxies at a fixed stellar mass form later in lower mass dark matter haloes, and earlier in massive haloes. We interpret this as a `halo downsizing' effect; however some of this evolution could be attributed to halo assembly bias.

Louise Edwards (Caltech/IPAC)

Constraints on the Intra-Filament Medium (P6)

Dario Fadda, Herschel Science Center, IPAC

When studying the history of a people, it would be prudent to have a firm understanding of their relationship to the surrounding environment. Many galaxies are found in complex environments. They are often found in pairs, groups, or clusters. Cosmological simulations predict that these clusters are connected on a larger scale by filaments. Such filaments may affect the evolution of galaxies within. Because these large scale structures are so vast, and because they are of intermediate density, observational constraints on their properties are difficult to achieve, and are only now beginning. We announce the first discovery of a bent double lobe radio source in a known cluster scale filament. The radio galaxy is found at a distance of 3.1Mpc from the center of the rich cluster Abell~1763. From the bend of the AGN jets, we are able to probe the density of the surrounding intra-filament medium (IFM) which we measure to be 1-8x10^{-29} gm/cm3. This is consistent with direct probes of the IFM as well as theoretical models.

Kambiz Fathi (Stockholm Observatory)

On a Method to Resolve the Nuclear Activity in Galaxies (P7)

Per Olof Lindblad, Kambiz Fathi

Nuclear regions of galaxies generally host a mixture of components with different excitation, composition, and kinematics. Derivation of emission line ratios and kinematics could then be misleading, if due correction is not made for the limited spatial and spectral resolutions of the observations. The aim of this paper is to demonstrate, with application to a long slit spectrum of the Seyfert 2 galaxy NGC 1358, how line intensities and velocities, together with modeling and knowledge of the point spread function, may be used to resolve the differing structures. In the situation outlined above, the observed kinematics differs for different spectral lines. From the observed intensity and velocity distributions of a number of spectral lines, and with some reasonable assumptions about structure of different subcomponents to diminish the number of free parameters, the true line ratios and velocity structures may be deduced. A preliminary solution for the nuclear structure of NGC 1358 is obtained, involving a nuclear point source and an emerging outflow of high excitation, ending with shock and post-shock cloud as revealed by the velocities, as well as a nuclear emission line disk rotating in the potential of a stellar bulge and expressing a radial excitation gradient. The method results in a likely scenario for the nuclear structure of the Seyfert 2 galaxy NGC 1358. For definitive results an extrapolation of the method to two dimensions combined with the use of integral field spectroscopy will be necessary.

Isaura Fuentes-Carrera (ESFM-IPN)

Star Formation History in Isolated LIRGs: Clues to Star-Forming Processes at Higher Redshifts (P7)

Lorenzo Olguin, Universidad de Sonora (Mexico) Patricia Ambrocio, Universidad de Hidalgo (Mexico) Simon Verley, Universidad de Granada (Spain) Celia Vazquez Perez, ESFM-IPN (Mexico)

Luminous infrared galaxies (LIRGs) are galaxies with total infrared (IR) luminosity between 10^11 and 10^12 solar luminosities. The high IR luminosities of LIRGs result from thermal dust heating in starburst (SBs), or active galactic nuclei (AGN). In order for a star-forming galaxy to emit at a LIRG level, it must have a very high star formation rate (SFR), in excess of ~17 solar masses per year. In the local Universe, galaxy-galaxy interactions or mergers primarily trigger these high SFR. However the rise in the number density of LIRGs with redshift appears to be unrelated to any change in the merger rate. Several authors show that roughly 50 % of intermediate redshift LIRGs are disk galaxies with little sign of recent merger activity. While morphology rules out major mergers as triggers for the majority of intermediate redshift LIRGs, interactions with neighbors, minor mergers, or bar instabilities may contribute. It is currently a matter of debate, whether the intermediate redshift LIRGs are "triggered" or experiencing "normal", if elevated, SF. The question arises regarding which processes could be originating such an enhanced SF without the presence of any external perturbers. In order to address this issue we present a study of similar systems in the Local Universe by analyzing the star-formation history (SFH) of isolated LIRGS from the AMIGA catalog. Direct imaging, long-slit spectroscopy and extended scanning Fabry-Perot spectroscopy are used to map the SF regions and underlying stellar population in these galaxies, as well as gas motions involved in the SF processes.

Kevindran Govender (South African Astronomical Observatory) (P8)

The IAU Office for Astronomy Development

In 2008 the International Astronomical Union (IAU) began the drafting of a decadal strategy entitled "Astronomy for the Developing World" - this strategy was later ratified at the IAU General Assembly in 2009. In order to realize this visionary strategy, which would seek to build astronomy in developing countries, a coordinating "Office for Astronomy Development" (OAD) was established in South Africa in 2010. This presentation will describe the IAU strategy from Africa's perspective and look at the process of selecting the host country for the OAD. It will also discuss the envisaged plans, with a special focus on how Africa could benefit from this OAD.

Edward Guinan (Villanova University / IAU TAD Program)

Improving the Extragalactic Distance Scale using Eclipsing Binary Stars in Local Group Galaxies (P9)

Edward Fitzpatrick (Villanova Univ.), Francesc Vilardell Salles (Univ. d'Alacant), Ignasi Ribas (CSIC-IEEC, Barcelona), Alceste Bonanos (Nat. Obs. of Athens), Scott Engle (Villanova Univ.), Andrej Prsa (Villanova Univ.), Thomas Santapaga (Villanova Univ.)

Eclipsing binaries, both inside and outside our Galaxy, are proving to be powerful tools for studying a wide spectrum of astrophysical problems. They are also are extremely valuable for providing fundamental quantities such as stellar masses, radii, luminosities, ages and distances. Recently, eclipsing binaries are turning out to be accurate distance indicators for determining accurate distances to nearby galaxies – such as the Magellanic Clouds, the Andromeda Galaxy (M31) and the Triangulum Sprial Galaxy (M33). For example -see Guinan et al. (2007). At the present time over 10,000 eclipsing binaries have been discovered in Local Group galaxies. These systems are mostly members of the Magellanic Clouds, M31 and M33. But also an increasing number of extragalactic binaries are being found as members of dwarf elliptical galaxies and low surface density irregular galaxy members of the Local Group. We report on the progress of this program to study eclipsing binaries (EBs) in the Local Group galaxies. The primary goals of the program are to determine accurate distances and physical properties of the stars, and to probe the structure and evolution of the host galaxies. In particular, the distance to the Large Magellanic Cloud (LMC) is critically important because this nearby galaxy is used to calibrate most of the important cosmic distance indicators such as Cepheid and RR
Lyr variables. Over the last several years, we have demonstrated that the distance of the LMC can be reliability measured using selected eclipsing binaries. The combined analyses of the UV/optical spectrophotometry, radial velocities, and light curves yield the stars' physical propertied (mass, radius, Teff, luminosity, metal abundance) and accurate (~3%) distances. So far, the physical properties and distances of luminosity, metal abundance) and accurate (~3%) distances. So far, the physical properties and distances of five LMC EBs have been completed and yield a distance to the centroid of the d(LMC) = 48.3 +/-1.6 kpc (m- M = 18.43+/-0.04) . Also using independent distances measures of three EBs in M31 (see Vilardell et al. 2010) yields: d (M31) = 744 +/- 33 kpc (m-M = 24.36 +/-08). The results of our extragalactic eclipsing binary program are discussed along with future plans of improving the distance to M33 and also the analysis of stellar populations and dynamics of Local Group galaxies using eclipsing binary systems. This research is support by grants from NASA (HST, GALEX and FUSE) and the US National Science Foundation (grant NSF-AST 05-07542)

Julie Hlavacek-Larrondo (University of Cambridge)

Highly-luminous cool core clusters of galaxies:

mechanically-driven or radiatively-driven AGN? (P10)

A. Fabian, University of Cambridge

Cool core clusters of galaxies require strong feedback from their central AGN to offset cooling. These AGN provide excellent tools for studying the feedback processes that arise in galaxies, where energy can be injected into the surrounding medium either radiatively or mechanically. We present a study of strong cool core, highly-luminous (most with Lx-ray>10^45 erg/s), clusters of galaxies in which the mean central AGN jet power must be very high yet no central point X-ray source is detected. Using the unique spatial resolution of Chandra, a sample of 13 clusters is analyzed, including A1835, A2204, and one of the most massive cool core clusters, RXCJ1504.1-0248. All of the central galaxies host a radio source, indicating an active nucleus, and no obvious X-ray point source. For all clusters in the sample, the nucleus has an X-ray bolometric luminosity below 2 per cent of that of the entire cluster. We investigate how these clusters can have such strong X-ray luminosities, short radiative cooling-times of the inner intracluster gas requiring strong energy feedback to counterbalance that cooling, and yet have such radiatively-inefficient cores with, on average, Lkinetic\Lnuc exceeding 200. Explanations of this puzzle carry significant implications for the origin and operation of jets, as well as on establishing the importance of kinetic feedback for the evolution of galaxies and their surrounding medium.

Chris Impey (University of Arizona)

The Co-evolution of Galaxies and Supermassive Black Holes in the COSMOS Survey (P11)

Jon Trump (University of Arizona)

Every galaxy harbors a supermassive black hole with mass proportional to the bulge or old stellar mass of the galaxy, so the paradigm of galaxy evolution must be changed to accommodate black hole fueling and growth, and the effects of AGN feedback on the surrounding galaxy. The Cosmological Evolution Survey (COSMOS) is a unique tool for studying low level AGN activity and the co-evolution of galaxies and supermassive black holes. The survey is centered on the largest contiguous region of the sky ever imaged by HST; it includes complete multiwavelength coverage, and the largest joint samples of galaxy and AGN redshifts in any deep survey. This talk will cover the search for AGN with low black hole mass, low accretion rates, and levels of obscuration that remove them from optical surveys. A complete census of intermediate mass black holes at redshifts 1-3 is required to tell the complete story of the co-evolution of galaxies and black holes.

Edward Jurua (Mbarara University of Science and

Technology)

Re-assessment of the Accretion Disc Clock in Hercules X-1 (P12)

M. Still,(NASA Ames Research Center M/S 244-30, Moffett Field, CA 94035, USA) P.J. Meintjes (University of the Free State, P.O. Box 334, Bloemfontein 9300, South Africa) P.A. Charles (South African Astronomical Observatory, P.O. Box 9, Observatory 7935, South Africa, and School of Physics & Astronomy, University of Southampton, Southampton SO17 1BJ, JK)

The Galactic neutron star X-ray binary Her X-1 shows a 35-day photometric modulation. Detected across a broad energy range, the modulation is prevalent in X-rays, cycling between low and high states. The 35-day modulation is believed to result from the periodic occultation of the neutron star by a warped processing disc around the central neutron star. Since the discovery of the 35-day cycle of Her X-1, the X-ray source has entered and returned from an extended anomalous low state on at least seven occasions. Employing Rossi X-ray Timing Explorer All-Sky Monitor observations, prior predictions that Her X-1 would return from the 2003 - 2004 anomalous low state with a new precession period and accretion luminosity are verified. However, the precession has not been as coherent over recent years as predicted. Potentially there have been more minor anomalous low states between 2004 and the present day.

Zacharie KAM (Université de Montréal)

Deep HI and Halpha Mapping of M31 & M33 (P13)

Claude Carignan (Université de Montréal) & Laurent Chemin (Observatoire de Bordeaux)

We perform a deep HI and Halpha mapping of M31 and M33 in order to get accurate kinematical data of these two galaxies and also to make comparison between the HI and Halpha kinematics. The HI data were these two galaxies and also to make comparison between the HI and Halpha kinematics. The HI data were obtained with the DRAO interferometer and the Halpha data using the Fabry-Perot system of the Observatoire du mont Mégantic using an EMCCD as a detector. Those data will provide the best possible datasets to derive accurate rotation curves and mass models for those two Local Group spirals.

Shinya Komugi (NAOJ/ALMA)

All-Disk Imaging of M33 at 1.1mm using AzTEC on ASTE (P14)

Omoka Tosaki (Joetsu U.), Kotaro Kohno (U. Tokyo), et al.

The nearby spiral galaxy M33 was mapped in the 1.1mm dust continuum using the AzTEC camera on ASTE. The survey spanned the whole optical disk at 30" resolution and has a dust mass sensitivity of 600 solar masses. By combining with Spitzer far-IR imaging, we derive a smooth temperature gradient in the galaxy decreasing from 25 to 13 K. Comparisons of the cold dust temperature in individual star forming regions with K band images and star formation rates show that even in the massive star forming regions, the heating of cold dust is driven by non-massive stars observed in the K band. The relation between spectroscopically derived metallicities and dust temperature are consistent with non-massive star heating, but show variations within the galaxy, indicating that the contribution of UV photons on the heating vary greatly within the galaxy.

Bruno Letarte (South African Astronomical Observatory)

Chemical Analysis of Fornax dSph (P15)

The Fornax dSph is a nearby dwarf spheroidal galaxy with five globular clusters and a complex star formation history. It is one of the more massive dwarf spheroidal type galaxies in the Local Group. Using the FLAMES /GIRAFFE spectrograph on the VLT we have obtained useful high resolution (R~20000) spectra for 81 Red Giant Branch stars in the central 25 arcmin field of the galaxy. The elements we have been able to measure include alpha elements, (Mg, Si, Ca, Ti); iron-peak elements, (Cr, Ni); and heavy elements (Y, Ba, Eu, La, Nd).

John Menzies (SAAO)

Local Group Galaxies in the Near Infrared (P16)

M.W. Feast (University of Cape Town) P.A. Whitelock (SAAO)

At SAAO we have used the Infrared Survey Facility to investigate the AGB stars in all accessible Local Group galaxies. A number of Mira variables have been found in the dwarf spheroidals, allowing us to test the period luminosity relation and to determine distances. This poster will discuss some of the closer galaxies.

Bonaventure Okere (Centre for Basic Space Science, Nsukka, Nigeria)

Photometric Evolution of post-AGB Stars (P17)

P.N. Okeke, Centre for Basic Space Science Nsukka S. Deguchi, Nobeyama Radio Observatory Japan N. Kuno, Nobeyama Radio Observatory Japan S. Takano, Nobeyama

Radio Observatory Japan

Post-AGB stars are generally believed to be on their way to the planetary nebula stage. However, there has been a question about the evolutionary path for the low-mass ones. We present BVRIJHK photometry of 75 post-AGB candidates selected on their IRAS colors. Their spectral energy distributions showed that a good number of the objects were very likely to be post-AGB stars. Few of the objects were remarkable in that their central stars were of rather late spectral type while the dynamical ages of their detached dust shell were considerably older than the others. We believe they are low mass post-AGB stars dispersing their dust shells which will not become planetary nebula but will directly evolve to white dwarfs.

Daniel POMAREDE (CEA/IRFU - Saclay)

Interactive Visualization of 3D Redshift Surveys with SDvision (P18)

Marguerite PIERRE (CEA/IRFU - Saclay)

The three-dimensional visualization of redshift surveys is a key player in the comprehension of the structuration of the cosmic web. The SDvision software package, intended primarily for the visualization of massive cosmological simulations, has been extended to provide an interactive visual representation of different classes of redshift surveys, with the objective to enable direct comparisons between the low statistics X-ray clusters samples of the XMM-LSS Survey and the high-statistics photometric redshift catalogues of the CFHTLS in the W1 field. We present the various possibilities offered by this tool in terms of filtering of the data, reconstruction of density fields, interactivity and visual rendering, including various techniques such as ray-casting, isosurfaces, slicing and texturing. This is illustrated using the C1 and C2 samples of the XMM-LSS Survey, and the publicly released COSMOS and CFHTLS photometric redshift Catalogs. Comparisons with published results are presented and discussed.

Denis Puy (University of Sciences Montpellier)

Seed of First Stars, Role of Primordial Molecules (P19)

Primordial molecules appeared early in the history of our Universe. The understanding of molecular formation as a consequence of cosmological recombination is of primary importance. In this talk I will present the crucial role played by primordial molecules on the dynamics of gravitational collapse of first structures. We will describe the different observational outlooks.

Zara Randriamanakoto (South African Astronomical Observatory, SAAO)

Super Star Cluster Luminosity Functions in Interacting Luminous Infrared Galaxies (P20)

Petri Vaisanen (SAAO), Stuart Ryder (Anglo-Australian Observatory), Seppo Matilla (Tuorla Observatory, Finland)

Young and massive super star clusters (SSCs) are found whenever very acitve star formation is going on, such that in interacting luminous infrared galaxies (LIRGs). From a deep NIR adaptive optics imaging survey, we present thus-far the first K-band SSC luminosity function (LF) in these types of galaxies. Based on the derived LF, one can constrain the cluster initial mass function (CIMF) and study the formation and evolution of SSCs. Our preliminary results are in disagreement with theoretical expectations which suggest that SSC LF should be well fitted by a single power law -2. We get power-law indices (~ -1.5) much shallower than the theoretically expected one. Taken at face value, our results support the concept that CIMF is mass dependent, not universal.

Laurie Rousseau-Nepton (Université Laval)

The HII Regions of M74 and M101 seen with SpIOMM (P21)

Laurie Rousseau-Nepton, Carmelle Robert, & Laurent Drissen

My researches focus on the HII regions in the Grand Design spiral galaxies M74 and M101. The characteristic spectrum of HII regions is due to interactions between the interstellar gas and the young and massive OB stars. With SpIOMM, I obtained numerous spectra in the visible range, covering several emission lines simultaneously over the whole galaxies. Long slit spectroscopy at the Observatoire du Mont-Mégantic is also presented, supplying a wider spectral range and showing absorption lines from older stellar populations. The parameters measured in this study are: electronic temperature and density of the gas, ionization factor, gradient of abundances, size and luminosity of HII regions, star formation rate, position and age of the different stellar populations, and rotation field. Diverse mechanisms are considered to explain the compression of the gas responsible for the bursts of star formation: feedback by stellar winds and supernovae, internal processes in the galaxy like spiral arms and bar, or external processes like interactions between galaxies and gas inflow. The final goal is to redraw the evolutionary history of the galaxies.

Antti Tamm (Tartu Observatory, Estonia)

Stellar Populations and dark matter in M31 (P22)

Elmo Tempel (Tartu Obs.), Peeter Tenjes (Tartu Obs.; The Univ. of Tartu), Taavi Tuvikene (Tartu Obs.)

Properties of the stellar populations in our large neighbour galaxy M31 are studied on the basis of the Sloan Digital Sky Survey optical and Spitzer far-infrared imaging and several studies of the kinematics. Using the FIR mappings of dust distribution and temperature, the intrinsic optical emission distribution is uncovered, allowing us to constrain the intrinsic luminosities, spectral energy distributions and geometry of the stellar populations. With the help of kinematic data and stellar population synthesis models, we constrain masses and mass-to-light ratios of the stellar populations and the parameters of the dark matter halo.

Bruno Thooris (CEA/IRFU Saclay)

Three-dimensional Visualization of Cosmological and Galaxy Formation Simulations (P23)

Daniel Pomarède CEA/IRFU Saclay

Our understanding of the structuring of the Universe from large-scale cosmological structures down to the formation of galaxies now largely benefits from numerical simulations. The RAMSES code, relying on the Adaptive Mesh Refinement technique, is used to perform massively parallel simulations at multiple scales. The interactive, immersive, three-dimensional visualization of such complex simulations is a challenge that is addressed using the SDvision software package. Several rendering techniques are available, including raycasting and isosurface reconstruction, to explore the simulated volumes at various resolution levels and casting and isosurface reconstruction, to explore the simulated volumes at various resolution levels and construct temporal sequences. These techniques are illustrated in the context of different classes of simulations. We first report on the visualization of the HORIZON Galaxy Formation Simulation at MareNostrum, a cosmological simulation with detailed physics at work in the galaxy formation process. We then carry on in the context of an intermediate zoom simulation leading to the formation of a Milky-Way like galaxy. Finally, we present a variety of simulations of interacting galaxies, including a case-study of the Antennae Galaxies interaction.

Dario TREVESE (Sapienza Universita di Roma)

The Large Scale Structure in the Chandra Deep Field South (P24)

Fabrizio FIORE INAF- Osservatorio Astronomico di Roma

In previous studies we have proposed a method, based on photometric redshifts (Trevese+ 2007 A&A 463, 853), to detect over densities in the large-scale distribution

December 13-17, 2010

Home
Conference Information
Venue
Scientific Rationale
Meeting Context
Participants
Schedule
Registration
Submit Abstract
Letter of invitation
IAU grants
IUPAP/UNESCO grants
Lodging
Conference poster
Proceedings
AfAS workshop
Social Events
Local Information
Organizing Committees
Contact us

Participants

There are 97 participants registered to date:

Name	Organization	Title of presentation
Babagana ABUBAKAR	Kanuri Development Association	The Position of the Moon, Sun, Stars and Space Sciences in Africa
Philippe AMRAM	Laboratoire d'Astrophysique de Marseille	3D Spectroscopic Surveys of Late-Type Galaxies
Simon ANGUMA KATRINI	MBARARA UNIVERSITY OF SCIENCE & TECHNOLOGY	Developing Astronomy in Uganda
Jacques BOULESTEIX	LAM / POPsud	
Jonathan BRAINE	Observatoire de Bordeaux	The Herschel M33 Extended Survey: Gas and Dust in M33
HECTOR BRAVO-ALFARO	Universidad de Guanajuato, Mexico	Environmental Effects in Galaxy Clusters: HI-VLA, CO-IRAM and Deep NIR Imaging in Abell 1367 and Abell 85
Veronique BUAT	Laboratoire d'Astrophysique de Marseille	Hidden and Visible Star Formation in Galaxies: what do we Learn from AKARI and Herschel?
Martin BUREAU	University of Oxford	Molecular Gas and Star Formation in Local Early-Type Galaxies
Denis BURGARELLA	Laboratoire d'Astrophysique de Marseille	The Herschel Far Infrared Emission of Lyman Break Galaxies at 0.8 < z < 2.5 (GALEX dropouts) in the GOODS fields: do we Understand Everything ?
Claude CARIGNAN	Université de Ouagadougou & Université de Montréal	Astrophysics in Burkina Faso
Caitlin CASEY	Hawaii	Completing the Census of High-z Extreme Starbursts
Ana CHIES SANTOS	Astronomical Institute Utrecht	Ages of Globular Cluster Systems Related to Galaxy Morphology
Francoise COMBES	Observatoire de Paris, LERMA	Surveys of the Molecular Content of Galaxies at all z
Christopher CONSELICE	U. of Nottingham	Clustering properties of galaxies selected in stellar mass: breaking down the link between luminous and dark matter in massive galaxies from z = 0 to z = 2 An Empirical Review of Galaxy Formation
Thierry CONTINI	Laboratoire d'Astrophysique de Toulouse-Tarbes	Probing the Mass Assembly and Chemical Evolution of High-z Galaxies with MASSIV
Stephane COURTEAU	Queen's University	Scaling Relations of Galaxies
Timothy DAVIDGE	Herzberg Institute of Astrophysics	Shaken, but not Stirred: The Disrupted Disk of NGC 253
Erwin DE BLOK	University of Cape Town	Large HI Surveys with MeerKat
Marie-Maude DE DENUS-BAILLARGEON	Université de Montréal	Fixing the Stellar Disk-to-Luminosity Ratio for Kinematics Studies in Individual Galaxies
Jean-Pierre DE GREVE	Vrije Universiteit Brussel	Astronomy Education: the Road to Enthusiasm for Studying Science
Paola DI MATTEO	Observatoire de Paris, GEPI	Gas Inflows and Metallicity Evolution in Merging Pairs
Mark DICKINSON	NOAO	Observing Galaxy Assembly with Optical and Infrared Surveys

Yacouba DJABO	Université de Montréal	
Laurent DRISSEN	Université Laval	SpIOMM and SITELLE: Wide-Field Hyperspectral Imagers for the Study of Galaxy Evolution
Pierre-Alain DUC	AIM, CEA Paris Saclay	Reconstructing the Mass Assembly of Early-Type Galaxies with Collisional Debris
Florence DURRET	Institut d'Astrophysique de Paris	Environmental Effects on Galaxy Luminosity Functions in Clusters
Louise EDWARDS	Caltech/IPAC	Constraints on the Intra-Filament Medium
Sara ELLISON	University of Victoria	Gas Flows in Galaxies: Mergers and Bars
Eric EMSELLEM	ESO	3D Spectroscopic Surveys of Early-Type Galaxies
Benoît EPINAT	LATT	Spectroscopic Surveys: Exploring Galaxy Evolution Mechanisms
Kambiz FATHI	Stockholm Observatory	Scale Length of Disk Galaxies in the Local Universe
		On a Method to Resolve the Nuclear Activity in Galaxies
Bradley FRANK	University of Cape Town	Comparisons of HI and CO Dynamics of THINGS Galaxies
Ken FREEMAN	Mt Stromlo Observatory	
Isaura FUENTES-CARRERA	ESFM-IPN	Star Formation History in Isolated LIRGs: Clues to Star-Forming Processes at Higher Redshifts.
Michele GERBALDI	Institut d'Astrophysique de Paris - France	
Thiago GONçALVES	Caltech	Lyman Break Analogs: Constraints on the Formation of Extreme Starbursts at Low and High Redshift
Kevindran GOVENDER	South African Astronomical Observatory	The IAU Office for Astronomy Development
Edward GUINAN	Villanova University / IAU TAD Program	Improving the Extragalactic Distance Scale using Eclipsing Binary Stars in Local Group Galaxies
		The IAU Teaching Astronomy for Development (IAU/TAD) Program: Focus on Africa
Hitoshi HANAMI	Iwate University	Reconstruction of Star Formation and AGN Activities in Galaxies Classified with the Balmer Break, 1.6 µm Bump, and PAH Features up to z=2
George HEALD	ASTRON	The WSRT HALOGAS Survey: Status and First Results
Olivier HERNANDEZ	LAE - CRAQ - Université de Montréal	Tracing the Ancestry of Galaxies using 3D spectroscopy
Julie HLAVACEK-LARRONDO	University of Cambridge	Highly-luminous cool core clusters of galaxies: mechanically-driven or radiatively-driven AGN?
Luis HO	Carnegie Observatories	The Carnegie-Irvine Nearby Galaxies Survey
Chris IMPEY	University of Arizona	The Co-evolution of Galaxies and Supermassive Black Holes in the COSMOS Survey
Jonas JOHANSSON	University of Portsmouth	The Chemical Enrichment Histories of SDSS Galaxies
Gyula I. G. JOZSA	ASTRON (NWO)	Warps and Accretion
Edward JURUA	Mbarara University of Science and Technology	Re-assessment of the Accretion Disc Clock in Hercules X-1
Zacharie KAM	Université de Montréal	Deep HI and Halpha Mapping of M31 & M33.
Prime KARERA	Université du Burundi	
Shinya KOMUGI	NAOJ/ALMA	All-Disk Imaging of M33 at 1.1mm using AzTEC on ASTE
		The AKARI Far-Infrared All-Sky Survey Image : Dust Properties of Galaxies in the Local Universe

Nario KUNO	Nobeyama Radio Observatory	NRO Legacy Project: M33 all Disk Survey of Giant Molecular Clouds with NRO 45-m and ASTE 10-m Telescopes
Olivier LE FEVRE	Laboratoire d'Astrophysique de Marseille	Large High Redshift Spectroscopic Surveys
Loic LE TIRAN	GEPI - Observatoire de Paris	The Turbulent ISM of Galaxies about 10 Gyrs ago: an Impact on their IMF?
Guy LEBA KABONGO	Depart. of Physics,National Pedagogic University	
Lerothodi LEEUW	University of Johannesburg	
Bruno LETARTE	South African Astronomical Observatory	Chemical Analysis of Fornax dSph
Roberto MAIOLINO	Astronomical Observatory of Rome	The Metallicity Evolution of Galaxies through the Cosmic Epochs
Claudia MARASTON	University of Portsmouth	Stellar Populations at High Redshift
		Recovering Galaxy Stellar Population Properties from Spectral Energy Distribution Fitting
Hugo MARTEL	Université Laval	Chemical Signature of Gas-Rich Disc-Disc Mergers at High Redshift
Christopher MARTIN	California Institute of Technology	Exploring Galaxy Evolution with GALEX UV Surveys
John MENZIES	SAAO	Local Group Galaxies in the Near Infrared
George MILEY	Leiden Observatory	The IAU Strategic Plan: Astronomy for the Developing World
Pheneas NKUNDABAKURA	Kigali Institute of Education	Unveiling the Nature of two Unidentified Blazar Candidates Through Spectroscopic Observations
Bonaventure OKERE	Centre for Basic Space Science, Nsukka, Nigeria	Photometric Evolution of post-AGB Stars
Hakeem OLUSEYI	Florida Institute of Technology	Galactic Archaeology Using RR Lyrae Stars Observed by the LSST
Bruce PARTRIDGE	Haverford College	What Radio Astronomy Can Tell us about Galaxy Formation
Jean-Claude PECKER	Collège de France	
Isabel PEREZ	Universidad de Granada	Tracing the Origin of Bars and Bulges through the Study of their Stellar and Ionised Gas Properties
D.J. PISANO	West Virginia University	The Evolution of Luminous Compact Blue Galaxies: Disks or Spheroids?
Okeke PIUS	Centre for Basic Space Science, Nsukka, Nigeria	
Daniel POMAREDE	CEA/IRFU - Saclay	Interactive Visualization of 3D Redshift Surveys with SDvision
Leila POWELL	CEA-Saclay	The Impact of ISM Turbulence, Clustered Star Formation and Feedback on Galaxy Mass Assembly through Cold Flows and Mergers
Mathieu PUECH	GEPI - Observatoire de Paris/CNRS	The Evolution of the Baryonic Tully-Fisher Relation over the past 6 Gyr
Denis PUY	University of Sciences Montpellier	Seed of First Stars, Role of Primordial Molecules
Andreas QUIRRENBACH	Landessternwarte Heidelberg	
Zara RANDRIAMANAKOTO	South African Astronomical Observatory	Super Star Cluster Luminosity Functions in Interacting Luminous Infrared Galaxies.
Carmelle ROBERT	Université Laval	The Study of Barred Spiral Galaxies with IFUs
Margarita ROSADO	IA-UNAM	Dynamics of Interacting Galaxies
Laurie ROUSSEAU-NEPTON	Université Laval	The HII Regions of M74 and M101 seen with SpIOMM

Patricia SANCHEZ-BLAZQUEZ	Universidad Autonoma de Madrid	Quantifying the Redistribution of Mass and Angular Momentum in the Galactic Disks due to Bars
Ruben SANCHEZ-JANSSEN	ESO	AVOCADO: A Virtual Observatory Census to Address Dwarfs Origins
Marcin SAWICKI	Saint Mary's University	The Build-up of Stellar Mass in High-Redshift Galaxies
David SCHADE	Canadian Astronomy Data Centre	The Post-Virtual Observatory World View
Joe SILK	Oxford University	The Role of Feedback in Baryon Acquisition
Christian SURACE	Laboratoire d'Astrophysique de Marseille	The Virtual Observatory : Data, Standards and Tools
Antti TAMM	Tartu Observatory, Estonia	Stellar Populations and dark matter in M31
Lidia TASCA	Laboratoire d'Astrophysique de Marseille	Where is the Light? Evolution of Bulges and Disks since z~0.8
Abiy TEKOLA	University of Cape Town/South African Astronom. Ob	The Environments of Local Luminous Infrared Galaxies (LIRGs) and their Star Formation Density Relationship
Bruno THOORIS	CEA/IRFU Saclay	Three-dimensional Visualization of Cosmological and Galaxy Formation Simulations
Laurence TRESSE	Laboratoire d'Astrophysique de Marseille	
Dario TREVESE	SAPIENZA UNIVERSITA' DI ROMA	The Large Scale Structure in the Chandra Deep Field South
Brent TULLY	University of Hawaii	Cosmic Flows
Luc TURBIDE	Université de Montréal	
Petri VAISANEN	South African Astronomical Observatory	African Eyes on the Sky - the Southern African Large Telescope
		A Variety of Star-Formation in Strongly Interacting Galaxies
Jacqueline VAN GORKOM	Columbia University	Gas and Galaxy Evolution in the Local Universe
Simon WHITE	Max Planck Institute for Astrophysics	Simulating the Evolution of the Galaxy Population
Patricia WHITELOCK	SA Astronomical Observatory/University of Cape Tow	Asymptotic Giant Branch Variables in NGC6822

International Astronomical Union
Union Astronomique Internationale

POST MEETING REPORT FORM

for meetings other than Joint Discussions and Special Sessions

Deadline for Submission: within 1 month after the meeting

the following information should be sent to the IAU Assistant General Secretary

The following documents should be attached:

i Final Scientific Program

ii List of participants

iii List of recipients of IAU Grants, including amount and country

iv Receipts signed by the recipients of IAU Grants (This does not apply to Scientific Meetings held during General Assemblies)

v Brief report (text.txt file or word.doc) to the Executive Committee on the scientific highlights of the meeting (1-2 pages)

1. Meeting Number: XIII
2. Meeting Title: LATIN AMERICAN REGIONAL IAU MEETING
3. Coordinating Division: NONE
4. Dedication of meeting (if any): NONE
5. Location (city, country): MORELIA, MEXICO
6. Dates of meeting: 8 - 12 NOVEMBER 2010
7. Number of participants: 290
8. List of represented countries: ARGENTINA, BRAZIL, CHILE, MEXICO, URUGUAY, VENEZUELA, PANAMA, HONDURAS, USA, FRANCE, COLOMBIA, SWEDEN, GERMANY, SPAIN, JAPAN
9. Report submitted by: LUIS F. RODRIGUEZ
10. Date and place: DEC. 12, 2010, MORELIA, MEXICO
11. Signature of SOC Chairperson: Luis F. Rodríguez

LARIM2010 Highlights

The XIII Latin American Regional IAU Meeting presented a broad outline of several of the many lines of research that are being followed nowadays in Latin America. The SOC organized the Meeting in such a way that it started with the very large (cosmology, large-scale structure) and ended with the objects in our Solar System (asteroids, Kuiper belt objects).

On Monday November 8, 2010 the Meeting started with a review by Mario Hamuy (Chile) on the work of his group on supernovae and the goals of the Millenium Center for Supoernovae Studies. This was followed by a talk by Gustavo Bruzual (Venezuela) on his well-known and heavily referenced models for stellar population synthesis. Vladimir Avila-Reese (Mexico) discussed theory and observations on the mass-assemblying history of galaxies.

On Tuesday November 9, 2010 Luiz Nicolaci da Costa (Brazil) reviewed the relations between the existence of dark energy and the large-scale distribution of galaxies. Enrico Ramirez-Ruiz (USA) presented the state-of-the art in the theoretical studies of gamma-ray bursts, a field that has experienced remarkable development in the last decade. Finally. Misael Rosales (Venezuela) presented the technical characteristics and scientific possibilities of the LAGO (Large Aperture GRB Observatory), a project with strong latin american participation.

Wednesday November 10, 2010 was dedicated to a tour to an archaeological site as well as a colonial site and to the meeting banquet and other social activities.

On Thursday November 11, 2010 the meeting started with a review by Odylio Aguiar (Brasil) on the theory and observations of gravitational waves. Jorge Canto (Mexico) presented the notable advances in the understanding of the propagation of jets from young stars. The last review of the day was given by Paula Benaglia (Argentina) on the field of radio emission from stars.

The last day of the Meeting, Friday November 12, 2010 started with a review by Laurent Loinard (Mexico) on the ultra accurate astrometry being made by his group to determine precise distances to regions of star formation. Tatiana A. Michtchenko (Uruguay) presented recent developments in celestial mechanics, a field in which his country has made signidicant contributions. The last review of the meeting was given by Javier Licandro (Spain), who discussed with authority the topic of transitional asteroid-comet objects.

LARIM 2010

XIII Latin American Regional IAU Meeting

Final Program

Morelia, Michoacán, México

8–12 November 2010

Program of talks

LUNES 8 DE NOVIEMBRE			
09:00		**Inauguración**	
Moderator: Luis F. Rodríguez			
09:25	Review	Mario Hamuy	El Centro Milenio de Estudios de Supernovas
10:10	Review	Gustavo Bruzual	Modeling stellar populations near and far
10:55		**Refrescos y POSTERS I**	
11:40		**SESIONES PARALELAS**	**1A, 1B, 1C**
13:40		**COMIDA**	
Moderator: Kathy Vivas			
16:00	Review	Vladimir Ávila-Reese	The mass-assembling history of galaxies: observations vs. models
16:45	Invited	Nelson Padilla	Assembly of early type galaxies
17:10	Invited	Octavio Valenzuela	Galactic and sub-Galactic cosmology
17:35		**Refrescos y POSTERS I**	
18:20		**SESIONES PARALELAS**	**2A, 2B, 2C**
19:40		Fin de sesión	
MARTES 9 DE NOVIEMBRE			
Moderator: Zulema Abraham			
09:00	Review	Luiz Nicolaci da Costa	Dark energy and the large-scale distribution of galaxies

09:45	Review	Enrico Ramirez-Ruiz	Gamma-ray bursts
10:30	Invited	Santiago E. Pérez Bergliaffa	Nonsingular cosmological models
10:55		**Refrescos y POSTERS I**	
11:40		**SESIONES PARALELAS**	**3A, 3B, 3C**
13:40		**COMIDA**	
Moderator: Enrico Ramirez-Ruiz			
16:00	Review	Misael Rosales	El Observatorio LAGO (Large Aperture GRB Observatory)
16:45	Invited	William Lee	Accretion modes onto compact objects and the production of GRBs
17:10	Invited	Magdalena González	El observatorio de rayos gamma HAWC
17:35		**Refrescos y POSTERS I**	
18:20		**SESIONES PARALELAS**	**4A, 4B, 4C**
19:40		Fin de sesión	
MIÉRCOLES 10 DE NOVIEMBRE			
08:00		**Tour:**	Las Yácatas y Pátzcuaro
14:00		**COMIDA**	En el Campus UNAM
16:00		Foto de grupo	
16:30		**Regreso al Hotel Fiesta Inn**	
JUEVES 11 DE NOVIEMBRE			
Moderator: Susana Lizano			
09:00	Review	Odylio D. Aguiar	Detección de ondas gravitacionales
09:45	Review	Jorge Cantó	Jets de estrellas jóvenes: teoría
10:30	Invited	Mariana Orellana	Emisión de rayos gamma en microcuasares
10:55		**Refrescos y POSTERS II**	
11:40		**SESIONES PARALELAS**	**5A, 5B, 5C**

13:40		**COMIDA**	
Moderator: Enrique Vázquez-Semadeni			
16:00	Review	Paula Benaglia	Radio emission from massive protostellar objects
16:45	Invited	Martin Makler	Dark matter and strong gravitational lensing
17:10	Invited	Diego Falceta-Gonçalves	Interstellar turbulence
17:35		**Refrescos y POSTERS II**	
18:20		**SESIONES PARALELAS**	**6A, 6B, 6C**
19:20		Fin de sesión	
19:30		**Evento cultural:**	Actuación del Ballet Folklórico "Coyucán"
VIERNES 12 DE NOVIEMBRE			
Moderator: Fernando Roig			
09:00	Review	Laurent Loinard	Mapping star-formation in the Milky Way
09:45	Review	Tatiana A. Michtchenko	New results on celestial mechanics
10:30	Invited	Roberto Saito	Vista Variables in the Vía Láctea (VVV): current status and perspectives
10:55		**Refrescos y POSTERS II**	
11:40		**SESIONES PARALELAS**	**7A, 7B, 7C**
13:40		**COMIDA**	
Moderator: Gonzalo Tancredi			
16:00	Review	Javier Licandro	The transitional asteroid-comet objects
16:45	Invited	Juan José Downes	The formation and early evolution of brown dwarfs viewed through the Orion dispersed populations

17:10	Invited	Fernando Roig	The background population of asteroids in the Main and Trojan Asteroid Belts
17:35		**Refrescos y POSTERS II**	
18:20		**SESIONES PARALELAS**	**8A, 8B, 8C**
19:20		Asamblea y **CLAUSURA**	

Parallel sessions

Monday 8 November, 11:40–13:40

Session 1A	**Session 1B**	**Session 1C**
Galaxies (including AGNs)	*Stars, stellar systems, and star formation*	*Cosmology*
Moderator: Luis Aguilar	***Moderator: Leticia Carigi***	***Moderator: Santiago Pérez-Bergliaffa***
Características de las galaxias espirales enanas **A. M. Hidalgo-Gámez**	Proper motion study of the Magellanic Clouds using SPM material **Katherine Vieira**	Modification of Newtonian dynamics through generalization of Einstein's cosmological term as an alternative to dark matter **Nelson Falcón**
Disruption of dwarf satellite galaxies without dark matter **Rigoberto Casas-Miranda**	A multi-wavelength study of symbiotic stars in the Magellanic Clouds **R. Angeloni**	Constraining the dark energy equation of state using alternative cosmic tracers **Ricardo Chávez**
Study of dwarf AGN candidates **J. P. Torres-Papaqui**	On the chemical connection between the Galactic bulge and the thick disk **Alan Alves-Brito**	The angular power spectrum of dust-obscured galaxies and its impact on Sunyaev-Zel'dovich studies **A. Montaña**
Origin and evolution of the Sagittarius dwarf galaxy using N-body simulations **Carmen Adriana Martínez-Barbosa**	Investigating the outskirts of the Milky Way: the Pisces overdensity **Kathy Vivas**	Sunyaev-Zel'dovich detected massive cluster at $z \sim 1$: a constraint on σ_8 **L. Infante**

The rôle of tidal dwarf galaxies in galaxy evolution **Duilia de Mello**	Measuring the Galactic thick disk with QUEST-I RR Lyrae stars **Cecilia Mateu**	Studying the formation and evolution of galaxy clusters using millimeter-wavelength observations **Milagros Zeballos**
HOLMES and the little monsters **Grażyna Stasińska**	Structural parameters of M81 compact star clusters **M. Santiago-Cortés**	Gravitational lensing and dynamics in the galaxy group SL2S J02140-0535 **T. Verdugo**

Monday 8 November, 18:20–19:40

Session 2A *Galaxies (including AGNs)* ***Moderator: Érika Benítez***	**Session 2B** *Stars, stellar systems, and star formation* ***Moderator: Mauricio Tapia***	**Session 2C** *Cosmology* ***Moderator: Gladis Magris***
Induced nuclear activity in galaxy pairs **Francisco Hernández-Ibarra**	Effects of helium enrichment in globular cluster populations **Aldo A. R. Valcarce**	A variable IMF slope to fit the LCDM picture to observed high-z submm sources **Alejandra Muñoz**
The precessing jet in the core of NGC 1275 (3C84) **Zulema Abraham**	Confirmation of a recent bipolar ejection in the very young hierarchical multiple system IRAS 16293−2422 **Gerardo Pech**	Dissecting the cosmic star-formation history **M. Muñoz-Gutiérrez**
Correlations between properties of parsec-scale jets and optical nuclear emission of compact AGN **J. Torrealba**	El cúmulo globular NGC 6981: parámetros físicos y población de estrellas variables **R. Figuera Jaimes**	Seeding the disk galaxy population at different epochs **Aldo Rodríguez-Puebla**
Curvas de luz de M87 HST-1 como ondas de choque **Yaxk'in Ú Kan Coronado González**	Hα and O III emission-line maps of H II galaxies: characterizing the star formation **Ana Torres-Campos**	The mass power spectrum at galactic and subgalactic scales as a constraint to dark matter properties **Alma X. González-Morales**

Tuesday 9 November, 11:40–13:40

Session 3A *Galaxies (including AGNs)* ***Moderator: Vladimir Ávila***	**Session 3B** *Stars, stellar systems, and star formation* ***Moderator: Will Henney***	**Session 3C** *Cosmology and High energy astrophysics* ***Moderator: William Lee***

Supernova feedback and the bend of the Tully-Fisher relation
María Emilia De Rossi

Dynamics and large-scale star formation in disk galaxies
Rosa Amelia González Lópezlira

Migración del Sol y evolución química de la Galaxia
Leticia Carigi

The nature of assembly bias in a LCDM cosmology
Ivan Lacerna

Análisis de las características morfológicas y químicas de galaxias simuladas
Susana Pedrosa

Determinación de magnitudes físicas con modelos de síntesis inversa de poblaciones estelares
Gladis Magris C.

Gravitational stability of magnetized disks
S. Lizano

The inner regions of high accretion rate disks
P. D'Alessio

Census of protoplanetary disks in young stellar regions: a *Spitzer* view
Jesus Hernández

The CIDA-VISTA survey for young, low-mass stars in Orion OB1
César Briceño

Characteristics of the embedded cluster Tr 14-N4
Mauricio Tapia

VLBA astrometry to the proto–Herbig AeBe star EC 95 in the Serpens core
Sergio Dzib

The Euler Characteristic as a measure of the topology of reionization
Martina M. Friedrich

CCOs in SNR as neutron stars with growing magnetic fields
Giovanny Bernal

Transient gamma-ray emission from accreting black holes
Florencia L. Vieyro

The long-term polarimetric monitoring of blazars at San Pedro Mártir
Erika Benítez

Can T Tauri stars produce high-energy radiation?
María Victoria del Valle

Supernovae interacting with molecular clouds: high-energy aspects
Thierry Montmerle

Tuesday 9 November, 18:20–19:40

Session 4A
Galaxies (including AGNs)
Moderator: Rosa A. González

What multiwavelength monitoring of AGN can tell us about the accretion flow
Patricia Arevalo

Detection of extreme low-luminosity AGN's
Daniel Marcos Neri-Larios

Session 4B
Stars, stellar systems, and star formation
Moderator: Miguel Roth

Two new cataclysmic variables, SDSS1238 and SDSS0804, candidates for bounced-back systems
Andrés Avilés

An extremely long orbital period CV: SDSS0018+3454
Diego Hernando González Buitrago

Session 4C
High energy astrophysics and Interstellar medium
Moderator: Javier Ballesteros-Paredes

Electron acceleration in supernova remnant shocks
Mario A. Riquelme

H II region expansion in a magnetized turbulent medium
William J. Henney

Clustering and halo occupation distribution of active galactic nuclei **Takamitsu Miyaji**	Advances in the understanding of interacting binaries with additional long periods **R. E. Mennickent**	NANTEN ^{12}CO ($J = 1$–0) observations around the star WR 55 **N. U. Duronea**
EVN observations: unveiling the heart of (U)LIRGs. **C. Romero-Cañizales**	Asteroseismology of the Delta Scuti star V650 Tauri **L. Fox Machado**	The oxygen abundance in the Solar neighborhood **Mónica Rodríguez**

Thursday 11 November, 11:40–13:40

Session 5A *Galaxies (including AGNs)* ***Moderator: Gustavo Bruzual***	**Session 5B** *Stars, stellar systems, and star formation* ***Moderator: Paula Benaglia***	**Session 5C** *Interstellar medium* ***Moderator: Silvia Torres-Peimbert***
The AzTEC blank surveys: an overview of the high-z SMG population **Itziar Aretxaga**	On the formation of the most massive stars in the Galaxy **Roberto Galván-Madrid**	NGC 7009 and NGC 6826: a unified study of planetary nebulae and their central stars **Celia Fierro**
Lensed high-redshift galaxies in the *Herschel* ATLAS survey **David Hughes**	Observations of the photodissociated H I region that surrounds G213.880−11.837 **C. A. Rodríguez-Rico**	Evidencias observacionales del "backflow" en nebulosas planetarias altamente evolucionadas **Margarita Pereyra**
Dynamics of binary black holes in a hierarchical Universe **Eva Martínez-Palafox**	Embedded young stellar objects in the Galactic star-forming region IRAS18236-1205 **R. Retes**	PNe as observational constraints in chemical evolution models for NGC 6822 **L. Hernández-Martínez**
Submillimeter galaxies behind the Bullet Cluster **Omar López-Cruz**	New results on the HH80-81 radio jet **Carlos Carrasco-González**	Abundancias químicas de las nebulosas planetarias en NGC 300 **M. Peña**
Multicolour evolution of the galaxy Red Sequence at high redshift **A. D. Romeo**	Thermal radio emission from radiative shocks in colliding wind binaries **Gabriela Montes**	Detection of new planetary nebulae with the IPHAS survey **Laurence Sabin**
The distant Hubble sequence with *HST/ACS*, leading the way to the new Observatory of Panama **Rodney Delgado-Serrano**	How turbulent is molecular cloud turbulence? **Javier Ballesteros-Paredes**	Faint emission lines in Galactic planetary nebulae with [WC] nuclei **Jorge García-Rojas**

Thursday 11 November, 18:20–19:20

Session 6A *History, Outreach, and other topics* ***Moderator: Adriana Gazol***	**Session 6B** *Stars, stellar systems, and star formation* ***Moderator: Cesar Briceño***	**Session 6C** *Interstellar medium* ***Moderator: Ricardo González***
Astronomía oficial y astronomía popular: ¿encuentro o desencuentro? **Susana Biro**	Study of filamentary structures across the Galactic plane **Yanett Contreras**	El RSN IC443 observado en 74 y 330 MHz: análisis de su distribución espectral **G. Castelletti**
Astronomy outreach **Julieta Fierro**	Tidal forces as a regulator of star formation in Taurus: a numerical study **Andrés Suárez-Madrigal**	Star-forming regions towards stellar wind bubbles: the ring nebulae RCW 52 and RCW 78 **Cristina Cappa**
La Revista Mexicana de Astronomía y Astrofísica, una opción real de publicación astronómica **Silvia Torres-Peimbert**	Several ways to brightness **Michael Richer**	Emisión de rayos X de burbujas interestelares alrededor de estrellas Wolf-Rayet **Jesús A. Toalá Sánz**

Friday 8 November, 11:40–13:40

Session 7A *Galaxies (including AGNs)* ***Moderator: Itziar Aretxaga***	**Session 7B** *Stars, stellar systems, and star formation, and Planetary systems* ***Moderator: Yolanda Gómez***	**Session 7C** *Interstellar medium* ***Moderator: Manuel Peimbert***
Constraining the active galactic nucleus contribution in a sample of Seyfert galaxies: photoionization modeling **Mariela Martínez**	Physical parameters and chemical abundances in bipolar PNe **Daniel Moser Faes**	Mass and metal ejection efficiency in disk galaxies driven by young stellar clusters of nuclear starbursts **Ary Rodríguez-González**
High-redshift objects in dust environments **Eric Martínez**	Expansion angular de la nebulosa planetaria IC418 **L. Guzmán-Ramírez**	The molecular ISM associated with the super star cluster Westerlund 1 **A. Luna**

A local diagnostic for the Milky Way dark matter halo triaxiality
Armando Rojas Niño

Atomic line broadening by thermal energy fluctuations in stellar atmospheres and plasmas
O. Cardona

Induced star formation in the H II region Sh2–54
J. Vásquez

Bar detection in isolated and pairs of galaxies
Hugo Méndez-Hernández

The nature of transition circumstellar disks in the Lupus molecular clouds
G. A. Romero

Formación estelar en los bordes de regiones H II
S. Paron

NGC 3516: Spectral features and their relation with X-ray variability in time
Eréndira M. Huerta

High-cadence NIR observations of extrasolar planets
Claudio Cáceres

Iron depletion in ionized nebulae of the Large Magellanic Cloud
Gloria Delgado-Inglada

The universality of the fundamental plane for galaxies and galaxy systems
Hector Javier Ibarra Medel

Dynamical method to detect a third object around a cataclysmic variable: the FS Aurigae case
Carlos E. Chávez

The density power spectrum in turbulent thermally bi-stable flows
Adriana Gazol

Friday 12 November, 18:20–19:20

Session 8A
Galaxies (including AGNs)
Moderator: Octavio Valenzuela

Modeling the spiral arms of the Milky Way using manifolds
M. Romero-Gómez

GTC long-slit spectroscopy of compact stellar clusters in M81
Y. D. Mayya

3D visualization of evolutionary diagrams for quasars in the parameter space 4DE1
Omar Anguiano Sánchez

Session 8B
Planetary systems
Moderator: Jesús Hernández

Application of granular physics to impact processes on asteroids and comets
Gonzalo Tancredi

The effect of a strong stellar flare on the atmospheric chemistry of an Earth-like planet orbiting an M dwarf
Antígona Segura

Session 8C
Interstellar medium
Moderator: Miriam Peña

On the O/H, Mg/H, Si/H, and Fe/H gas and dust abundance ratios in Galactic and extragalactic H II regions
Manuel Peimbert

Physical conditions and chemical composition of the Small Magellanic Cloud H II region NGC 456
Maria Ángeles Peña-Guerrero

List of participants

Zulema Abraham	IAG, Universidade de São Paulo, Brasil zulema@astro.iag.usp.br
Lucía Adame	University of Michigan, USA adamel@umich.edu
Odylio D. Aguiar	Instituto Nacional de Pesquisas Espaciais, Brasil odylio@das.inpe.br
Emmaly Aguilar	INAOE, Tonantzintla, México emmaly82@gmail.com
Luis A. Aguilar	IA-UNAM, Ensenada, México aguilar@astrosen.unam.mx
Andrea V. Ahumada	ESO, Chile/UNC, Argentina andreav.ahumada@gmail.com
Karla Álamo-Martínez	CRyA-UNAM/ESO, Chile kalamo@eso.org
Manuel Álvarez	IA-UNAM, Ensenada, México alvarez@astrosen.unam.mx
Ramiro Álvarez	Instituto de Ciencias Nucleares, UNAM, México ramiro.alvarez@nucleares.unam.mx
Alan Alves-Brito	Pontificia Universidad Católica de Chile abrito@astro.puc.cl
Vladimir Ávila-Reese	Instituto de Astronomía, UNAM, México avila@astro.unam.mx
Rodolfo Angeloni	Pontificia Universidad Católica de Chile rangelon@astro.puc.cl
Omar Anguiano Sánchez	Instituto de Astronomía, UNAM, México anguiano@astro.unam.mx
Timo Anguita	PUC, Chile/MPIA, Germany tanguita@astro.puc.cl
Itziar Aretxaga	INAOE, Tonantzintla, México itziar@inaoep.mx
Patricia Arevalo	Universidad Andrés Bello, Chile arevalo@mpa-garching.mpg.de

Jane Arthur	CRyA-UNAM, Morelia, México j.arthur@crya.unam.mx
Martin Ávalos	CRyA-UNAM, Morelia, México m.avalos@crya.unam.mx
Andrés Avilés	IA-UNAM, Ensenada, México aaviles@astrosen.unam.mx
Javier Ballesteros	CRyA-UNAM, Morelia, México j.ballesteros@crya.unam.mx
Aldo Batta	Instituto de Astronomía, UNAM, México abatta@astro.unam.mx
Paula Benaglia	IAR-CONICET-UNLP, Argentina pbenaglia@fcaglp.unlp.edu.ar
Erika Benítez	Instituto de Astronomía, UNAM, México erika@astro.unam.mx
César Augusto Bernal Herrera	Instituto de Astronomía, UNAM, México cbernal@astroscu.unam.mx
Giovanny Bernal	ESFM, IPN, México bernalcg@gmail.com
Susana Biro	DGDC-UNAM, México sbiro@servidor.unam.mx
Pedro Paulo Bonetti Beaklini	IAG, Universidade de São Paulo, Brasil beaklini@astro.iag.usp.br
Joannes Bosco Hdz.-Aguilar	INAOE, Tonantzintla, México jbosco@inaoep.mx
César Briceño	CIDA, Venezuela briceno@cida.ve
Gustavo Bruzual	CIDA, Venezuela bruzual@cida.ve
Valeria Buenrostro	CRyA-UNAM, Morelia, México v.buenrostro@crya.unam.mx
Claudio Cáceres	Pontificia Universidad Católica de Chile cccacere@astro.puc.cl
Hernando Efraín Caicedo Ortiz	ESFM-IPN, México hecaicedo@gmail.com
Anahí Caldú Primo	Instituto de Astronomía, UNAM, México anahicp@gmail.com
Vianey Camacho	UMSNH, Morelia, México edaly.v@gmail.com
Jorge Cantó	Instituto de Astronomía, UNAM, México juanita@astroscu.unam.mx
Cristina Cappa	IAR-CONICET-UNLP, Argentina ccappa@fcaglp.unlp.edu.ar

Octavio Cardona	INAOE, Tonantzintla, México ocardona@inaoep.mx
Leticia Carigi	Instituto de Astronomía, UNAM, México carigi@astroscu.unam.mx
Carlos Carrasco-González	IAA-CSIC, España charly@iaa.es
Francisco Carvajal	Universidad de Panamá fcocarvajal25@hotmail.com
Rigoberto Casas-Miranda	Universidad Nacional de Colombia racasasm@unal.edu.co
Gabriela Castelletti	IAFE-CONICET-UBA, Argentina gcastell@iafe.uba.ar
Daniel Castillo Rodríguez	Instituto de Astronomía, UNAM, México castillo@astroscu.unam.mx
Ángel Castro	IA-UNAM, Ensenada, México acastro@astrosen.unam.mx
Márcio Catelan	Pontificia Universidad Católica de Chile mcatelan@astro.puc.cl
José Arturo Celis-Gil	Universidad Nacional de Colombia solocelis@gmail.com
Carlos E. Chávez Pech	IA-UNAM, Ensenada, México carlosepech@astrosen.unam.mx
Miguel Chávez	INAOE, Tonantzintla, México mchavez@inaoep.mx
Ricardo Chávez	INAOE, Tonantzintla, México ricardoc@inaoep.mx
Pamela Colunga	Instituto de Astronomía, UNAM, México pamecolunga@gmail.com
Sandra M. Conde Cuellar	Universidad de Los Andes, Venezuela mafis172@yahoo.com
Ma. Eugenia Contreras	IA-UNAM, Ensenada, UNAM, México mcontreras@astrosen.unam.mx
Yanett Contreras	Universidad de Chile yanett@gmail.com
Yaxk'in Coronado González	Instituto de Astronomía, UNAM, México coronado@astro.unam.mx
Luis J. Corral	IAM, Universidad de Guadalajara, México lcorral@astro.iam.udg.mx
Alejandro H. Córsico	Universidad Nacional de La Plata, Argentina acorsico@fcaglp.unlp.edu.ar
Cristian Cortés	Universidade Federal do Rio Grande do Norte, Brasil cristian@dfte.ufrn.br

Marcus Vinícius Costa Duarte	IAG, Universidade de São Paulo, Brasil mvcduarte@astro.iag.usp.br
Roberto D. D. Costa	IAG, Universidade de São Paulo, Brasil roberto@astro.iag.usp.br
Irene Cruz-González	Instituto de Astronomia, UNAM, México irene@astro.unam.mx
Alicia Cruzado	Universidad Nacional de La Plata, Argentina acruzado@fcaglp.unlp.edu.ar
Salvador Curiel	Instituto de Astronomía, UNAM, México scuriel@astroscu.unam.mx
Paula D'Alessio	CRyA-UNAM, Morelia, México p.dalessio@crya.unam.mx
Luiz Nicolaci da Costa	Observatório Nacional, Brasil ldacosta@on.br
Giannina Dalle Mese	INAOE, Tonantzintla, México giannina@inaoep.mx
María Silvina De Biasi	Universidad Nacional de La Plata, Argentina debiasi@fcaglp.unlp.edu.ar
Eduardo de la Fuente	IAM, Universidad de Guadalajara, México edfuente@gmail.com
Mario De Leo Winkler	Instituto de Astronomía, UNAM, México madeleo@astroscu.unam.mx
María Victoria del Valle	IAR-CONICET-UNLP, Argentina maria@iar-conicet.gov.ar
Duilia de Mello	CUA/NASA GSFC, USA demello@cua.edu
María Emilia De Rossi	IAFE-CONICET-UBA, Argentina mariaemilia.dr@gmail.com
Gloria Delgado-Inglada	INAOE, Tonantzintla, México gloria@inaoep.mx
Rodney Delgado-Serrano	Universidad Tecnológica de Panamá rodney.delgado@obspm.fr
Horacio Dottori	Instituto de Física, UFRGS, Brasil dottori@if.ufrgs.br
Juan José Downes	CIDA, Venezuela jdownes@cida.ve
Carlos Antonio Duarte	Sociedad Astronómica de Michoacán, México carlosad@prodigy.net.mx
Vincent Dumont	Universidad de Chile vincentdumont11@gmail.com
Nicolás Duronea	IAR-CONICET-UNLP, Argentina duronea@gmail.com

María Carolina Durán Rojas	CRyA-UNAM, Morelia, México c.duran@crya.unam.mx
Sergio Dzib	CRyA-UNAM, Morelia, México s.dzib@crya.unam.mx
Vladimir Escalante	CRyA-UNAM, Morelia, México v.escalante@crya.unam.mx
Diego Falceta-Gonçalves	EACH, Universidade de São Paulo, Brasil rufos7@gmail.com
Nelson Falcón	Universidad de Carabobo, Venezuela nelsonfalconv@gmail.com
Gabriel Ferrero	Universidad Nacional de La Plata, Argentina gferrero@carina.fcaglp.unlp.edu.ar
Celia Fierro	Instituto de Astronomía, UNAM, México celiafresita@yahoo.com.mx
Julieta Fierro	Instituto de Astronomía, UNAM, México julieta@astroscu.unam.mx
Roberto Figuera Jaimes	Instituto de Astronomía, UNAM, México rfiguera@astro.unam.mx
Nahiely Flores-Fajardo	Instituto de Astronomía, UNAM, México nahiely@astroscu.unam.mx
Lester Fox Machado	IA-UNAM, Ensenada, México lfox@astrosen.unam.mx
Martina M. Friedrich	Stockholm University, Sweden martina@astro.su.se
Isaura Fuentes-Carrera	ESFN-IPN, México isaura.fuentescarrera@gmail.com
Phillip Andreas B. Galli	IAG, Universidade de São Paulo, Brasil galli@astro.iag.usp.br
Roberto Galván-Madrid	Harvard-Smithsonian CfA/CRyA-UNAM, México r.galvan@crya.unam.mx
Ángel M. García Reyes	Instituto de Astronomía, UNAM, México agarcia@astro.unam.mx
José Antonio García-Barreto	Instituto de Astronomía, UNAM, México tony@astroscu.unam.mx
Jorge García-Rojas	Instituto de Astrofísica de Canarias, España jogarcia@iac.es
Adriana Gazol	CRyA-UNAM, Morelia, México a.gazol@crya.unam.mx
Sol Gil	IA-UNAM, Ensenada, México solgil@astrosen.unam.mx
Rafael Girola	Universidad Nacional de Tres de Febrero, Argentina rafaelgirola@yahoo.com.ar

Yolanda Gómez	CRyA-UNAM, Morelia, México y.gomez@crya.unam.mx
Guilherme Gonçalves Ferrari	IF-UFRGS, Brasil gg.ferrari@gmail.com
Alejandro González	Instituto de Astronomía, UNAM, México ags@astroscu.unam.mx
Ietza González	Instituto de Astronomía, UNAM, México ietza_ugs@comunidad.unam.mx
Magdalena González	Instituto de Astronomía, UNAM, México magda@astro.unam.mx
Roberto González	University of Chicago, USA regonzar@oddjob.uchicago.edu
Ricardo F. González	CRyA-UNAM, Morelia, México rf.gonzalez@crya.unam.mx
Julián González Ayala	ESFM-IPN, México noldor_21@yahoo.com.mx
Diego H. González Buitrago	IA-UNAM, Ensenada, México dgonzalez@astrosen.unam.mx
Rosa A. González López lira	CRyA-UNAM, Morelia, México r.gonzalez@crya.unam.mx
Alma X. González-Morales	Instituto de Ciencias Nucleares, UNAM, México alma.gonzalez@nucleares.unam.mx
Jane Gregorio-Hetem	IAG, Universidade de São Paulo, Brasil jane@astro.iag.usp.br
Mónica Grosso	ICATE-CONICET, Argentina mgrosso@icate-conicet.gob.ar
Carlos Guerrero	Instituto de Astronomía, UNAM, México cguerrero@astro.unam.mx
Pedro F. Guillén	Instituto de Astronomia, UNAM, México fguillen@astro.unam.mx
Leonel Gutiérrez	IA-UNAM, Ensenada, México leonel@astrosen.unam.mx
Lizette Guzmán-Ramírez	Jodrell Bank Centre for Astrophysics, UK lizette.ramirez@postgrad.manchester.ac.uk
Mario Hamuy	Universidad de Chile mhamuy@das.uchile.cl
William J. Henney	CRyA-UNAM, Morelia, México w.henney@crya.unam.mx
Fabiola Hernández	CIDA, Venezuela fhernandez@cida.ve
Jesús Hernández	CIDA, Venezuela hernandj@cida.ve

Vicente Hernández	CRyA-UNAM, Morelia, México v.hernandez@crya.unam.mx
Claudia Hernández Mena	UAEM/ICF-UNAM, México cmena@fis.unam.mx
Aurora Hernández-Gómez	Instituto de Astronomía, UNAM, México ahgomez@astro.unam.mx
Francisco Hernández-Ibarra	Instituto de Astronomía, UNAM, México hibarra@astro.unam.mx
Liliana Hernández-Martínez	INAOE, Tonantzintla, México lhernand@astro.unam.mx
Oscar Hernandez Utrera	Instituto de Astronomía, UNAM, México outrera@astroscu.unam.mx
Guillermo Herrera-Martínez	INAOE, Tonantzintla, México gherrera@inaoep.mx
Annibal Hetem	Universidade Federal do ABC, Brasil annibal.hetem.jr@usa.net
Ana María Hidalgo-Gámez	ESFM-IPN, México ahidalgo@esfm.ipn.mx
Eréndira M. Huerta	Instituto de Astronomía, UNAM, México emhuerta@astro.unam.mx
David Hughes	INAOE, Tonantzintla, México dhughes@inaoep.mx
Eduardo Ibarra Medel	INAOE, Tonantzintla, México eduardoibarra.medel@gmail.com
Hector Javier Ibarra Medel	INAOE, Tonantzintla, México hjibarram@gmail.com
Leopoldo Infante	Pontificia Universidad Católica de Chile linfante@astro.puc.cl
Vera Jatenco-Pereira	IAG, Universidade de São Paulo, Brasil jatenco@astro.iag.usp.br
Solai Jeyakumar	Universidad de Guanajuato, México sjk@astro.ugto.mx
Juan Antonio Juárez Jiménez	ESFM-IPN, México juanantoniojj@gmail.com
Yari Juárez López	Instituto de Astronomía, UNAM, México yjuarez@astroscu.unam.mx
Simon Kemp	IAM, Universidad de Guadalajara, México snk@astro.iam.udg.mx
Iván Lacerna	Pontificia Universidad Católica de Chile ialacern@astro.puc.cl
Régis Lachaume	Pontificia Universidad Católica de Chile lachaume@astro.puc.cl

William Lee	Instituto de Astronomía, UNAM, México wlee@astro.unam.mx
Jacques R. D. Lépine	IAG, Universidade de São Paulo, Brasil jacques@astro.iag.usp.br
Hugo Levato	ICATE-CONICET, Argentina hlevato@icate-conicet.gob.ar
Javier Licandro	Instituto de Astrofísica de Canarias, España jlicandr@iac.es
Gastao B. Lima Neto	IAG, Universidade de São Paulo, Brasil gastao@astro.iag.usp.br
Susana Lizano	CRyA-UNAM, Morelia, México s.lizano@crya.unam.mx
Rogelio F. Lobato Ramos	Instituto de Astronomía, UNAM, México rlobato@astroscu.unam.mx
Laurent Loinard	CRyA-UNAM, Morelia, México l.loinard@crya.unam.mx
Sandra P. Londoño Gómez	Universidad Nacional de Colombia splondonog@unal.edu.co
Ricardo López	Universidad de Guadalajara, México ri_hunab_ku@yahoo.com
Omar López-Cruz	INAOE, Tonantzintla, México omarlx@inaoep.mx
Mónica Lozada Muñoz	Instituto de Astronomía, UNAM, México mlozada@astro.unam.mx
Leticia Luis	CRyA-UNAM, Morelia, México l.luis@crya.unam.mx
Abraham Luna	INAOE, Tonantzintla, México aluna@inaoep.mx
A. Moisés Magaña Zacarias	Instituto de Astronomía, UNAM, México mmagana@astro.unam.mx
Gladis Magris C.	CIDA, Venezuela magris@cida.ve
Martin Makler	Centro Brasileiro de Pesquisas Físicas, Brasil martinmakler@gmail.com
Stella Malaroda	ICATE-CONICET, Argentina smalaroda@icate-conicet.gob.ar
Guillermo Manjarrez	IAA-CSIC, España manjarrezg@gmail.com
Eric Martínez	CIDA, Venezuela emartinez@cida.ve
Mariela Martínez	Instituto Venezolano de Investigaciones Científicas mariellauriga@gmail.com

Mary Loli Martínez Aldama	Instituto de Astronomía, UNAM, México maldama@astro.unam.mx
Carmen A. Martínez-Barbosa	Universidad Nacional de Colombia anamabo3@gmail.com
Eva Martínez-Palafox	Instituto de Astronomía, UNAM, México evam@astro.unam.mx
Cecilia Mateu	CIDA, Venezuela cmateu@cida.ve
Juan Mateu	Universidad de Carabobo, Venezuela jmateu73@gmail.com
Divakara Mayya	INAOE, Tonantzintla, México ydm@inaoep.mx
Hugo Méndez-Hernández	Instituto de Astronomía, UNAM, México hmendez@astroscu.unam.mx
Eduardo Mendoza	INAOE, Tonantzintla, México mend@inaoep.mx
Ronald E. Mennickent	Universidad de Concepción, Chile rmennick@udec.cl
Tatiana A. Michtchenko	IAG, Universidade de São Paulo, Brasil tatiana@astro.iag.usp.br
Takamitsu Miyaji	IA-UNAM, Ensenada, México miyaji@astrosen.unam.mx
Christian Moni Bidin	Universidad de Concepción, Chile cmbidin@astro-udec.cl
Alfredo Montaña	INAOE, Tonantzintla, México amontana@inaoep.mx
Gabriela Montes	IAA-CSIC, España gmontes@iaa.es
Thierry Montmerle	IAU/UAI, France montmerle@iap.fr
Christophe Morisset	Instituto de Astronomía, UNAM, México chris.morisset@gmail.com
Daniel Moser Faes	IAG, Universidade de São Paulo, Brasil dmfaes@gmail.com
Alejandra Muñoz	Pontificia Universidad Católica de Chile amma.19@gmail.com
Pedro Leonardo Muñoz	Universidad Distrital Fco. José de Caldas, Colombia pedro2695@gmail.com
Marco A. Muñoz-Gutiérrez	Instituto de Astronomía, UNAM, México mmunoz@astro.unam.mx
Raúl Naranjo	CRyA-UNAM, Morelia, México rnaranjo@crya.unam.mx

Silvana G. Navarro Jiménez	IAM, Universidad de Guadalajara, México silvananj@gmail.com
Manuel Neri Gómez	CRyA-UNAM, Morelia, México m.neri@crya.unam.mx
Daniel Marcos Neri-Larios	Universidad de Guanajuato, México daniel@astro.ugto.mx
Citlali Neria	CRyA-UNAM, Morelia, México c.neria@crya.unam.mx
Ramona Núñez-López	Universidad de Sonora, México ramona@astro.uson.mx
Lorenzo Olguín	Universidad de Sonora, México lorenzo@astro.uson.mx
Paola Cecilia Oliva	Universidad Nacional Autónoma de Honduras paulacecil8@gmail.com
Javier Olivares Romero	Instituto de Astronomía, UNAM, México jromero@astroscu.unam.mx
Mariana Orellana	Universidad de Valparaíso, Chile/IAR, Argentina marian_orellana@yahoo.com
Rosa Beatriz Orellana	Universidad Nacional de La Plata, Argentina rorellan@fcaglp.unlp.edu.ar
René A. Ortega-Minakata	Universidad de Guanajuato, México rene@astro.ugto.mx
Nelson Padilla	Pontificia Universidad Católica de Chile npadilla@astro.puc.cl
Carmen P. Padilla-Torres	Instituto de Astrofísica de Canarias, España padilla@tng.iac.es
Sergio Paron	IAFE-CONICET-UBA, Argentina sparon@iafe.uba.ar
Laura Parrao	Instituto de Astronomía, UNAM, México laura@astroscu.unam.mx
Miriani Pastoriza	Universidade Federal do Rio Grande do Sul, Brasil miriani.pastoriza@ufrgs.br
Francisco Peñaloza	Universidad de Valparaíso, Chile paco.stilla@gmail.com
Susana Pedrosa	IAFE-CONICET-UBA, Argentina supe@iafe.uba.ar
Manuel Peimbert	Instituto de Astronomía, UNAM, México peimbert@astroscu.unam.mx
Margarita Pereyra	IA-UNAM, Ensenada, México mally@astrosen.unam.mx
Santiago E. Pérez Bergliaffa	Instituto de Física, UERJ, Brasil sepbergliaffa@gmail.com

Miguel Pérez Guillén	Instituto de Astronomía, UNAM, México jguillen@astro.unam.mx
Jennifer Pérez Oregon	ESFM-IPN, México jnnfr216@yahoo.com
Brenda Pérez-Rendón	Universidad de Sonora, México brenda@cajeme.cifus.uson.mx
Cintia S. Peri	Universidad Nacional de La Plata, Argentina cperi@fcaglp.fcaglp.unlp.edu.ar
Alberto Petriella	IAFE-CONICET-UBA, Argentina apetriella@iafe.uba.ar
Miriam Peña	Instituto de Astronomía, UNAM, México miriam@astro.unam.mx
Maria Ángeles Peña-Guerrero	Instituto de Astronomía, UNAM, México guerrero@astroscu.unam.mx
Marcos Peralta	Universidad de Sonora, México mperalta@astro.uson.mx
Andrés E. Piatti	IAFE-CONICET-UBA, Argentina andres@iafe.uba.ar
Giuliano Pignata	Universidad Andrés Bello, Chile gpignata@unab.cl
Olga I. Pintado	Instituto Superior de Correlación Geológica, Argentina olga.pintado@gmail.com
Manolis Plionis	INAOE, Tonantzintla, México mplionis@astro.noa.gr
Juan Abraham Quino Mendoza	IAM, Universidad de Guadalajara, México abrahamquino@gmail.com
Isidro Ramírez Ballinas	ESFM-IPN, México isidro@esfm.ipn.mx
Enrico Ramirez-Ruiz	University of California, Santa Cruz, USA enrico@ucolick.org
Victor Hugo Ramírez Siordia	CRyA-UNAM, Morelia, México v.ramirez@crya.unam.mx
Gerardo Ramos-Larios	IAM, Universidad de Guadalajara, México gerardo@astro.iam.udg.mx
Jackeline Suzett Rechy García	Universidad Veracruzana, México jaci34@hotmail.com
Elsa Recillas	INAOE, Tonantzintla, México elsare@inaoep.mx
Ricardo Retes	INAOE, Tonantzintla, México rretes@inaoep.mx
Jorge Reyes Iturbide	Instituto de Astronomía, UNAM, México jreyes@astroscu.unam.mx

Estela M. Reynoso	IAFE-CONICET-UBA, Argentina ereynoso@iafe.uba.ar
Michael Richer	IA-UNAM, Ensenada, México richer@astrosen.unam.mx
Mario A. Riquelme	University of California, Berkeley, USA marh@berkeley.edu
Juana Leticia Rivera	Instituto de Astronomía, UNAM, México jrivera@astro.unam.mx
Fátima G. Robles Valdéz	Instituto de Astronomía, UNAM, México frobles@astro.unam.mx
Santiago Roca	ICC-IEEC, Universitat de Barcelona, España sroca@am.ub.es
Carolina Rodríguez	CRyA-UNAM, Morelia, México ca.rodriguez@crya.unam.mx
Juan Carlos Rodríguez	Instituto de Ciencias Nucleares, UNAM, México juan.rodriguez@nucleares.unam.mx
Luis F. Rodriguez	CRyA-UNAM, Morelia, México l.rodriguez@crya.unam.mx
Mónica Rodríguez	INAOE, Tonantzintla, México mrg.inaoe@gmail.com
Ary Rodríguez-González	Instituto de Ciencias Nucleares, UNAM, México ary@nucleares.unam.mx
Mario Rodríguez-Martínez	Centro de Geociencias, UNAM, México mariorm@geociencias.unam.mx
Aldo Rodríguez-Puebla	Instituo de Astronomía, UNAM, México apuebla@astroscu.unam.mx
Carlos A. Rodríguez-Rico	Universidad de Guanajuato, México carlos@astro.ugto.mx
Fernando Roig	Observatório Nacional, Rio de Janeiro, Brasil froig@on.br
Armando Rojas Niño	Instituto de Astronomía, UNAM, México ozomatli@prodigy.net.mx
Alessio D. Romeo	Universidad Andrés Bello, Chile aromeo@unab.cl
Gisela Andrea Romero	Universidad de Valparaíso, Chile/UNLP, Argentina gisela@dfa.uv.cl
Cristina Romero-Cañizales	IAA-CSIC, España cromero@iaa.es
Merce Romero-Gómez	ICC-IEEC, Universitat de Barcelona, España mromero@am.ub.es
Misael Rosales	Universidad de Los Andes, Venezuela misael@ula.ve

Miguel Roth	Observatorio de Las Campanas, Chile miguel@lco.cl
Alex Ruelas-Mayorga	Instituto de Astronomia, UNAM, México rarm@astroscu.unam.mx
Verónica Ruiz	Universidad de El Salvador magnolias4@gmail.com
Laurence Sabin	IA-UNAM, Ensenada, México lsabin@astrosen.unam.mx
José Rodrigo Sacahui	Instituto de Astronomía, UNAM, México jsacahui@astro.unam.mx
Roberto K. Saito	Pontificia Universidad Católica de Chile rsaito@astro.puc.cl
Julieta Rut Salazar Contreras	Instituto de Astronomía, UNAM, México rsalazar@astroscu.unam.mx
Davíd Sánchez	INAOE, Tonantzintla, México domars@inaoep.mx
Marisol Sánchez	Instituto de Geofísica, UNAM, México marisol.sanchez@nucleares.unam.mx
Leonardo J. Sánchez P.	Instituto de Astronomía, UNAM, México leonardo@astroscu.unam.mx
Mayra Santiago-Cortés	INAOE, Tonantzintla, México scortes@inaoep.mx
Linda Schmidtobreick	ESO, Chile lschmidt@eso.org
Antígona Segura	Instituto de Ciencias Nucleares, UNAM, México antigona@nucleares.unam.mx
Simón Y. Silva F.	Universidad de Chile ssilva@das.uchile.cl
Grażyna Stasińska	LUTH, Observatoire de Paris, France grazyna.stasinska@obspm.fr
Wolfgang Steffen	IA-UNAM, Ensenada, México wsteffen@astrosen.unam.mx
Andrés Suárez-Madrigal	CRyA-UNAM, Morelia, México suarezandres@gmail.com
Daniel Tafoya	Kagoshima University, Japan dtafoya@milkyway.sci.kagoshima-u.ac.jp
Gonzalo Tancredi	Universidad de la República, Uruguay gonzalo@fisica.edu.uy
Mauricio Tapia	IA-UNAM, Ensenada, México mt@astrosen.unam.mx
Claus Tappert	Universidad de Valparaíso, Chile ctappert@dfa.uv.cl

Jorge A. Tarango	CRyA-UNAM, Morelia, México j.tarango@crya.unam.mx
Jesús A. Toalá Sánz	CRyA-UNAM, Morelia, México j.toala@crya.unam.mx
Janet Torrealba	INAOE, Tonantzintla, México cjanet@astroscu.unam.mx
Luis Alberto Torres Andrade	Instituto de Astronomía, UNAM, México luisfciencias@gmail.com
Ana Torres-Campos	INAOE, Tonantzintla, Puebla tcampos@inaoep.mx
Juan Pablo Torres-Papaqui	Universidad de Guanajuato, México papaqui@astro.ugto.mx
Silvia Torres-Peimbert	Instituto de Astronomía, UNAM, México silvia@astroscu.unam.mx
Dulce María Trejo-Rolón	IA-UNAM, Ensenada, México dulce@astrosen.unam.mx
Sandra P. Treviño-Morales	CRyA-UNAM, Morelia, México s.trevino@crya.unam.mx
Aldo A. R. Valcarce	Pontificia Universidad Católica de Chile avalcarc@astro.puc.cl
Octavio Valenzuela	Instituto de Astronomía, UNAM, México octavio@astro.unam.mx
Javier Vásquez	IAR-CONICET-UNLP, Argentina jvasquez@fcaglp.unlp.edu.ar
Roberto Vázquez	IA-UNAM, Ensenada, México vazquez@astro.unam.mx
Enrique Vázquez-Semadeni	CRyA-UNAM, Morelia, México e.vazquez@crya.unam.mx
Tomás Verdugo	Universidad de Valparaíso, Chile tverdugo@dfa.uv.cl
Katherine Vieira	CIDA, Venezuela kvieira@cida.ve
Florencia L. Vieyro	IAR-CONICET-UNLP, Argentina florenciavieyro@gmail.com
Kathy Vivas	CIDA, Venezuela akvivas@cida.ve
Manuel Zamora Aviles	CRyA-UNAM, Morelia, México m.zamora@crya.unam.mx
Luis A. Zapata	CRyA-UNAM, Morelia, México l.zapata@crya.unam.mx
Milagros Zeballos	INAOE, Tonantzintla, México zeballos@inaoep.mx

Janos Zsargo

ESFM-IPN, México
jzsargo@esfm.ipn.mx