

IAU Symposium

273

IAU Symposium

273

22 – 26 August 2010,
Ventura, California, USA

Proceedings of the International Astronomical Union

Physics of Sun and Star Spots

Physics of
Sun and
Star Spots

Edited by

Choudhary
Strassmeier

Debi Prasad Choudhary
Klaus G. Strassmeier

ISSN 1743-9213

International Astronomical Union



CAMBRIDGE
UNIVERSITY PRESS



Proceedings of the
International
Astronomical Union



CAMBRIDGE

CAMBRIDGE
UNIVERSITY PRESS

Physics of Sun and Star Spots

IAU SYMPOSIUM No. 273

COVER ILLUSTRATION:

Left: George Ellery Hale

Hale in the central hall of the National Academy of Sciences, viewing a solar image projected on a circular drum by the coelostat telescope located in the dome above. Over the drum swings the Foucault pendulum, showing the earth's rotation. This exhibit was designed and constructed under Hale's supervision for permanent display in the Academy's new building, dedicated on April 28, 1924.

George Hale discovered magnetic field in sunspots in 1908 using 60 foot solar tower at Mt. Wilson Observatory by applying the principle of Zeeman Splitting. The Zeeman splitting of the spectral line into several components happens in presence of magnetic field. This discovery marked the presence of extraterrestrial magnetism. (credit: Caltech Archives)

Cover designed by John Hodgson II

IAU SYMPOSIUM PROCEEDINGS SERIES

2010 EDITORIAL BOARD

Chairman

THIERRY MONTMERLE, IAU Assistant General Secretary
*Laboratoire d'Astrophysique, Observatoire de Grenoble,
414, Rue de la Piscine, Domaine Universitaire,
BP 53, F-38041 Grenoble Cedex 09, FRANCE
thierry.montmerle@obs.ujf-grenoble.fr*

Advisers

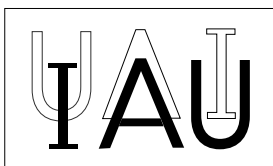
IAN F. CORBETT, IAU General Secretary,
European Southern Observatory, Germany
U. GROTHKOPF, *European Southern Observatory, Germany*
CHRISTIAAN STERKEN, *University of Brussels, Pleinlaan 2, 1050 Brussels, Belgium*

Members

- IAUS269
C. BARBIERI, *Università di Padova, Dipto di Astronomia, Vicolo dell'Osservatorio 2, IT
35122 Padova, Italy*
- IAUS270
J. ALVES, *Calar Alto Observatory, Centro Astronómico Hispano Alemán, c/ Jesus Durban
Remon 2-2, ES 04004 Almeria, Spain*
- IAUS271
A. SACHA BRUN, *CEA/DSM/IRFU, Service d'Astrophysique, CEA Saclay, FR 91191
Gif-sur-Yvette, France*
- IAUS272
C. NEINER, *GEPI, Observatoire Paris-Meudon, 5 place Jules Janssen, FR 92195 Meudon
Cedex, France*
- IAUS273
D. P. CHOUDHARY, *CSUN, Physics-Astronomy Dept., 18111 Nordhoff St, Northridge, CA
91330-8268, USA*
- IAUS274
A. BONNANO, *INAF, Osservatorio Astrofisico di Catania, Via S. Sofia 78, IT 95123
Catania, Italy*
- IAUS275
G. E. ROMERO, *Instituto Argentino de Radioastronomía, CC 5, AR Villa Elisa (Bs As)
1894, Argentina*
- IAUS276
A. SOZZETTI, *INAF, Osservatorio Astronomico di Torino, Strada Osservatorio 20, IT 10025
Pino Torinese, Italy*
- IAUS277
C. CARIGNAN, *Université de Montréal, Dept. de Physique, CP 6128 Succ. A, CA Montréal
QC H3C 3J7, Canada*

INTERNATIONAL ASTRONOMICAL UNION
UNION ASTRONOMIQUE INTERNATIONALE

International Astronomical Union



Physics of Sun and Star Spots

PROCEEDINGS OF THE 273th SYMPOSIUM OF THE
INTERNATIONAL ASTRONOMICAL UNION
HELD IN VENTURA, CALIFORNIA, USA
AUGUST 22–26, 2010

Edited by

Debi Prasad Choudhary

*California State University Northridge, 18111 Nordhoff St., Northridge, CA,
91330, CA*

Klaus G. Strassmeier

*Leibniz-Institute for Astrophysics, An der Sternwarte 16, D-14482 Potsdam,
Germany*



CAMBRIDGE UNIVERSITY PRESS
The Edinburgh Building, Cambridge CB2 2RU, United Kingdom
40 West 20th Street, New York, NY 10011-4211, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

© International Astronomical Union 2011

This book is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without
the written permission of the International Astronomical Union.

First published 2011

Printed in the United Kingdom at the University Press, Cambridge

Typeset in System L^AT_EX 2 ϵ

A catalogue record for this book is available from the British Library

Library of Congress Cataloguing in Publication data

This journal issue has been printed on FSC-certified paper and cover board. FSC is an independent, non-governmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see www.fsc.org for information.

ISBN 9780521760621 hardback
ISSN 1743-9213

Table of Contents

Organizing Committee	xii
Conference Photographs	xiii
Participants	xx
Organizing Committee Address	xxii

Oral Presentations

Cosmic magnetic fields in the Sun: Current outstanding problems <i>Eric Priest</i>	1
3D numerical MHD modeling of sunspots with radiation transport <i>Matthias Rempel</i>	8
Rapid changes of sunspot structure associated with solar eruptions <i>Haiman Wang & Chang Liu</i>	15
Helicity of the solar magnetic field <i>Sanjiv Kumar Tiwari</i>	21
Origin of solar magnetism <i>Arnab Choudhuri</i>	28
Diagnostics for spectropolarimetry and magnetography <i>Jose Carlos del Toro Iniesta & Valentín Martínez Pillet</i>	37
Heating of coronal active regions <i>Daniel Gómez</i>	44
Automated sunspot detection and the evolution of sunspot magnetic fields during solar cycle 23. <i>Fraser Watson & Lyndsay Fletcher</i>	51
On the manifestation in the Sun-as-a-star magnetic field measurements of the quiet and active regions. <i>Mikhail Demidov</i>	56
Starspots, cycles and magnetic fields <i>Steven Saar</i>	61
The evolution of stellar surface activity and possible effects on exoplanets <i>Mark Giampapa</i>	68

Rotational modulation, shear, and cyclic activity in HII 1883	74
<i>Jacquelynne Milingo, Steven Saar, Laurence Marschall, & John Stauffer</i>	
Starspot variability and evolution from modeling Kepler photometry of active late-type stars	77
<i>Alexander Brown, Heidi Korhonen, Svetlana Berdyugina, Barton Tofany, Thomas R. Ayres, Adam Kowalski, Suzanne Hawley, Graham Harper, & Nikolai Piskunov</i>	
The negative magnetic pressure effect in stratified turbulence	83
<i>Koen Kemel, Axel Brandenburg, Nathan Kleeorin, & Igor Rogachevskii</i>	
Stellar activity, differential rotation, and exoplanets	89
<i>Antonio Lanza</i>	
Study of stellar activity through transit mapping of starspots	96
<i>Adrianna Valio</i>	
Time series photometry and starspot properties	104
<i>Katalin Olah</i>	
Exploring the deep convection and magnetism of A-type stars	110
<i>Nicholas Featherstone, Matthew Browning, Allan Brun, & Juri Toomre</i>	
Chemical spots and their dynamical evolution on HgMn stars	116
<i>Heidi Korhonen, Svetlana Hubrig, Maryline Briquet, Federico González, & Igor Savanov</i>	
Differential rotation of the young solar analogue V889 Herculis	121
<i>Zolt Kövári, Antonio Frasca, Katia Biazzo, Krisztián Vida, Ettore Marilli & Ömür Ç akırlı</i>	
Long-term evolution of sunspot magnetic fields	126
<i>Matthew Penn & William Livingston</i>	
The formation of a penumbra as observed with the German VTT and SoHO/MDI	134
<i>Rolf Schlichenmaier, Nazaret Bello González, & Reza Rezaei</i>	
Global MHD phenomena and their importance for stellar surfaces	141
<i>Rainer Arlt</i>	
Solar subsurface flows of active regions: flux emergence and flare activity	148
<i>Rudolf Komm, Rachel Howe, Frank Hill, & Kiran Jain</i>	
Twist and writhe of δ -island active regions	153
<i>Marcelo López Fuentes, Cristina Mandrini, & Pascal Démoulin</i>	

Magnetic field evolution of active regions and sunspots in connection with chromospheric and coronal activities	157
<i>Toshifumi Shimizu</i>	
Solar activity due to magnetic complexity of active regions.	164
<i>Brigitte Schmieder, Cristina Mandrini, Ramesh Chandra, & Pascal Démoulin</i>	
Nature of the unusually long solar cycles.	169
<i>Nadezhda Zolotova & Dmitri Ponyavin</i>	
The zoo of starspots.	174
<i>Klaus Strassmeier</i>	
Exploring the magnetic topologies of cool stars	181
<i>J. Morin, J.-F. Donati, P. Petit, L. Albert, M. Aurire, R. Cabanac, C. Catala, X. Delfosse, B. Dintrans, R. Fares, T. Forveille, T. Gastine, M. Jardine, R. Konstantinova-Antova, J. Lanoux, F. Lignires, A. Morgenthaler, F. Paletou, J.C. Ramirez Velez, S.K. Solanki, S. Thado, V. Van Grootel</i>	
Spots on Betelgeuse, what are they?	188
<i>Andrea Dupree</i>	
The Butterfly Diagram leopard skin pattern	195
<i>Maurizio Ternullo</i>	
Turbulence and magnetic spots at the surface of hot massive stars.	200
<i>Matteo Cantiello, Jonathan Braithwaite, Axel Brandenburg, Fabio Del Sordo, Petri Käpylä, & Norbert Langer</i>	
Velocity fields in and around sunspots at the highest resolution	204
<i>Carsten Denker & Meetu Verma</i>	
Evolution of twist-shear and dip-shear in flaring active region NOAA 10930	212
<i>Sanjay Gosain & P. Venkatakrishnan</i>	
What determines the penumbral size and overshed flow speed	216
<i>Na Deng, Toshifumi Shimizu, Debi Choudhary, & Haiman Wang</i>	
In-depth survey of sunspot and active region catalogs	221
<i>Laure Lefèvre, Frédéric Clette, & Tunde Baranyi</i>	
The Sun at high-resolution: first results from the SUNRISE mission	226
<i>S. K. Solanki, P. Barthol, S. Danilovic, A. Feller, A. Gandorfer, J. Hirzberger, A. Lagg, T. L. Riethmüller, M. Schüssler, T. Wiegmann, J. A. Bonet, V. Martínez Pillet, E. Khomenko, J. C. del Toro Iniesta, V. Domingo, J. Palacios, M. Knölker, N. Bello González, J.M. Borrero, T. Berkefeld, M. Franz, M. Roth, W. Schmidt, O. Steiner, & A. M. Title</i>	

Coronal heating and flaring in QSLs	233
<i>Guillaume Aulanier</i>	
Modelling stellar coronal magnetic fields	242
<i>Moira Jardine, Jean-Francois Donati, Doris Arzoumanian, & Aline de Vidotto</i>	
The spots on Ap stars	249
<i>Oleg Kochukhov</i>	
Dynamo generated field emergence through recurrent plasmoid ejections.	256
<i>Jörn Warnecke & Axel Brandenburg</i>	
An A star on an M star during a flare within a flare	260
<i>Adam Kowalski, Suzanne Hawley, Jon Holtzmann, John Wisniewski, John P. Wisniewski, & Eric J. Hilton</i>	
Sunspots at centimeter wavelengths	265
<i>Mukul Kundu & Jeongwoo Lee</i>	
Global magnetic cycles in rapidly rotating younger suns	272
<i>Nicholas Nelson, Benjamin Brown, Matthew Browning, & Allan Sacha Brun, Mark S. Miesch & Juri Toomre</i>	
Magnetohydrostatic equilibrium in starspots: dependences on color (T_{eff}) and surface gravity (g).	276
<i>Paul Rajaguru & Siraj Hasan</i>	
Disentangling stellar activity and planetary signals	281
<i>Isabelle Boisse, Guillaume Hébrard, Xavier Bonfils, Nuno Santos & Sylvie Vauclair</i>	
First solar butterfly diagram from Schwabe's observations in 1825-1867	286
<i>Rainer Arlt & Anastasia Abdolvand</i>	
The structure and evolution of global star magnetic fields.	278
<i>Duncan Mackay</i>	
<i>Poster Presentations</i>	
Solar activity and differential rotation	298
<i>Hari Om Vats & Satish Chandra</i>	
Flare induced penumbra formation in the sunspot of NOAA 10838	303
<i>Sreejith Padinhatteeri & Sankarasubramanian K.</i>	
Dynamic responses of sunspots to their ambient magnetic configuration	308
<i>Somashekhar Bagare</i>	

Numerical simulations of mechanisms of magnetic structures	315
<i>Irina Kitiashvili, Alexander Kosovichev, Alan Wray, & Nagi Mansour</i>	
Investigation of a sunspot complex by time-distance helioseismology	320
<i>Alexander Kosovichev & Thomas Duvall Jr</i>	
Sunspot temperatures from red and blue photometry	325
<i>Gary Chapman, Angela Cookson, & Dora Preminger</i>	
A filament supported by different magnetic field configurations	328
<i>Yang Guo, Bridgitte Schmieder, Pascal Démoulin, Thomas Wiegmann, T. Török & V. Bommier</i>	
Are the photospheric sunspots magnetically force-free in nature?	333
<i>Sanjiv Kumar Tiwari</i>	
Vector magnetic field and vector current density in and around the δ -spot NOAA 10808 observed with THEMIS.	338
<i>Véronique Bommier, Egidio Landi Degl'Innocenti, Brigitte Schmieder, & Bernard Gelly</i>	
Substructure of quiet sun bright points	339
<i>Aleksandra Andic, Jongchul Chae, & Phillip Goode</i>	
Two types of coronal bright points, their characteristics, and evolution	343
<i>Isroil Sattarov, Nina Karachik, Chori Sherdanov, Azlarxon Tillaboev & Alexei A. Pevtsov</i>	
Distribution of magnetic shear angle in an emerging flux region	347
<i>Sanjay Gosain</i>	
Damping rates of p-modes by an ensemble of randomly distributed thin magnetic flux tubes	351
<i>Andrew Gascoyne & Rekha Jain</i>	
Subsurface flows associated with rotating sunspots.	356
<i>Kiran Jain, Rudolf Komm, Irene González Hernández, Sushant Tripathy, & F. Hill</i>	
Studies of waves in sunspots using spectropolarimetric observations.	361
<i>Gordon A. MacDonald & S. P. Rajaguru</i>	
A theoretical model of torsional oscillations from a flux transport dynamo model	366
<i>Piyali Chatterjee, Sagar Chakraborty, & Arnab Rai Choudhuri</i>	
The solar active region magnetic field and energetics	369
<i>Qiang Hu, Na Deng, Debi Choudhary, Brahama Dasgupta, & Jiangtao Su</i>	

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?	374
<i>Mikhail Demidov</i>	
Towards physics-based helioseismic inversions of subsurface sunspot structure	379
<i>Doug Braun, Aaron Birch, Ashley Crouch & Matthias Rempel</i>	
Helioseismic probing of the subsurface structure of sunspots	384
<i>Ashley Crouch, Aaron Birch, Doug Braun, & Christopher Clack</i>	
Temporal changes in the frequencies of the solar p-mode oscillations during solar cycle 23	389
<i>Edward Rhodes, Jr Johann Reiter, Jesper Schou, Tim Larson, P Scherrer, J Brooks, P McFaddin, B Miller, J Rodriguez, & J Yoo 1</i>	
Correlations of magnetic features and the torsional pattern	393
<i>Judit Muraközy & András Ludmány</i>	
Signature of collision of magnetic flux tubes in the quiet solar photosphere.	399
<i>Aleksandra Andic</i>	
Photospheric data programs at the Debrecen Observatory	403
<i>Lajos Györi, Tunde Baranyi, & Andrs Ludmány</i>	
Chromosphere above sunspots as seen at millimeter wavelengths	408
<i>Maria Loukitcheva, Sami Solanki, & Stephen White</i>	
Study of sunspot motion and flow fields associated with solar flares.	412
<i>Shuo Wang, Chang Liu, & Haimin Wang</i>	
Study of the change of surface magnetic field associated with flares.	417
<i>Yixuan Li, Ju Jing, Yuhong Fan, & Haimin Wang</i>	
Comparison of numerical simulations and observations of helioseismic MHD waves in sunspots	422
<i>Konstantin Parchevsky, Junwei Zhao, Alexander Kosovichev, & Matthias Rempel</i>	
Are the umbral dots, penumbral grains, and G band bright points formed by the same type of magnetic flux tubes?	426
<i>Isroil Sattarov</i>	
Possible explanations of the maunder minimum from a flux transport dynamo model.	430
<i>Bidyá Binay Karak & Arnab Rai Choudhuri</i>	
Evidence for the return meridional flow in the convection zone from latitude motions of sunspots.	434
<i>Koduvayur Sivaraman, Harikumar Sivaraman, S.S.Gupta & Robert Howard</i>	
Observations of density fluctuations in a quiescent prominence.	438
<i>Ken Nakatsukasa</i>	
Excitation of magneto-acoustic waves in network magnetic elements	442
<i>Yoshiaki Kato, Oskar Steiner, Matthias Steffen, & Yoshinori Suematsu</i>	

Solar flares forecasting using sunspot-groups classification and photospheric magnetic parameters	446
<i>Yuan Yuan, Frank Shih, Ju Jing, & Haimin Wang</i>	
Using SONG to probe rapid variability and evolution of starspots	451
<i>James E. Neff, Jon Hakkila, Frank Hill, Jason Jackiewicz, Travis S. Metcalfe, Jørgen Christensen-Dalsgaard, Søren Frandsen, Frank Grundahl, Hans Kjeldsen, Uffe Gråe Jørgensen, Per Kjærgaard Rasmussen, & Sheng-Hong Gu</i>	
Optical polarimetry and photometry of young Sun-like star LO Peg	455
<i>Jeewan Pandey, Biman Medhi, & Ram Sagar</i>	
Surface evolution in stable magnetic fields: The case of the fully convective Dwarf V374 Peg	460
<i>Krisztin Vida, Katalin Oláh, & Zsolt Kóvári</i>	
A nonlinear model for rotating cool stars	465
<i>Sydney Barnes</i>	
The dependence of maximum starspot amplitude and the amplitude distribution on stellar properties	469
<i>Steven Saar, Michelle Dyke, Søren Meibom, & Sydney Barnes</i>	
The effects of starspots on transit photometry	474
<i>John Hodgson II & Damian Christian</i>	
Structure of sunspots observed with Hinode solar optical telescope	478
<i>Debi Choudhary, Gordon MacDonald, Na Deng, & Shimizu Toshifumi</i>	
Laboratory simulation of solar magnetic flux rope eruptions	483
<i>S. K. P. Tripathi & W. Gekelman</i>	
Microwave Depolarization above Sunspots.	487
<i>Jeongwoo Lee & Stephen M. White</i>	
Damping and the period ratio $P_1/2P_2$ of non-adiabatic slow mode.	491
<i>Nagendra Kumar & Anil Kumar</i>	
Pre-Eruption Magnetic Configurations in the Active-Region Solar Photosphere	495
<i>Manolis K. Georgoulis</i>	
Author Index	499
Subject Index	502

THE ORGANIZING COMMITTEE

Scientific

Debi Prasad Choudhary (co-chair)	California State University, Northridge (USA)
Klaus G. Strassmeier (co-chair)	Astrophysical Institute Potsdam (Germany)
Carsten Denker	Astrophysical Institute Potsdam (Germany)
Oddbjorn Engvold	Institute of Theoretical Astrophysics (Norway)
Siraj Hasan	Indian Institute of Astrophysics (India)
Suzanne Hawley	University of Washington (USA)
Z. Hongqi	Beijing Astronomical Observatory, (China)
Cristina Mandrini	Universidad de Buenos Aires (Argentina)
Donald B. Melrose	University of Sydney (Australia)
Eric Priest	St Andrews University (United Kingdom)
Edward Rhodes	University of Southern California (USA)
T. Sakurai	National Astronomical Observatory of Japan (Japan)
Brigitte Schmieder	Institute of Theoretical Astrophysics (France)
Ashoke K. Sen	Assam University (India)
Michal Sobotka	Astronomical Institute (Czech Republic)
Jan O. Stenflo	Institute of Astronomy ETH Zurich (Switzerland)
Karel van der Hucht	Astronomical Institute (Netherlands)
Haimin Wang	New Jersey Institute of Technology (USA)

Local

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

Acknowledgements

The symposium is sponsored and supported by the IAU Divisions II (Sun and Heliosphere) and IV (Stars).

The Local Organizing Committee operated under the auspices of the Department of Physics and Astronomy, California State University, Northridge.

Funding by the following is gratefully acknowledged:

International Astronomical Union

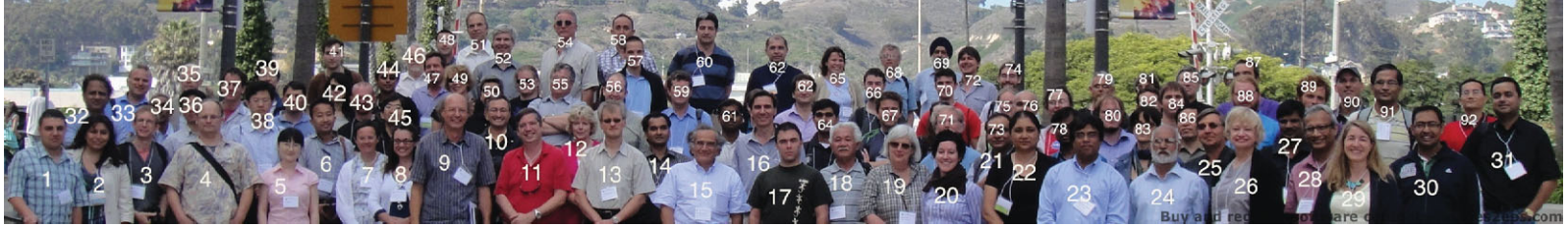
National Science Foundation, USA (Grants: ATM-0548260 and AST-0968672)

Living With a Star Program of NASA (Grant: NASA LWS NNX10AQ67G)

California State University, Northridge



Buy and register software contents-images2eps.com



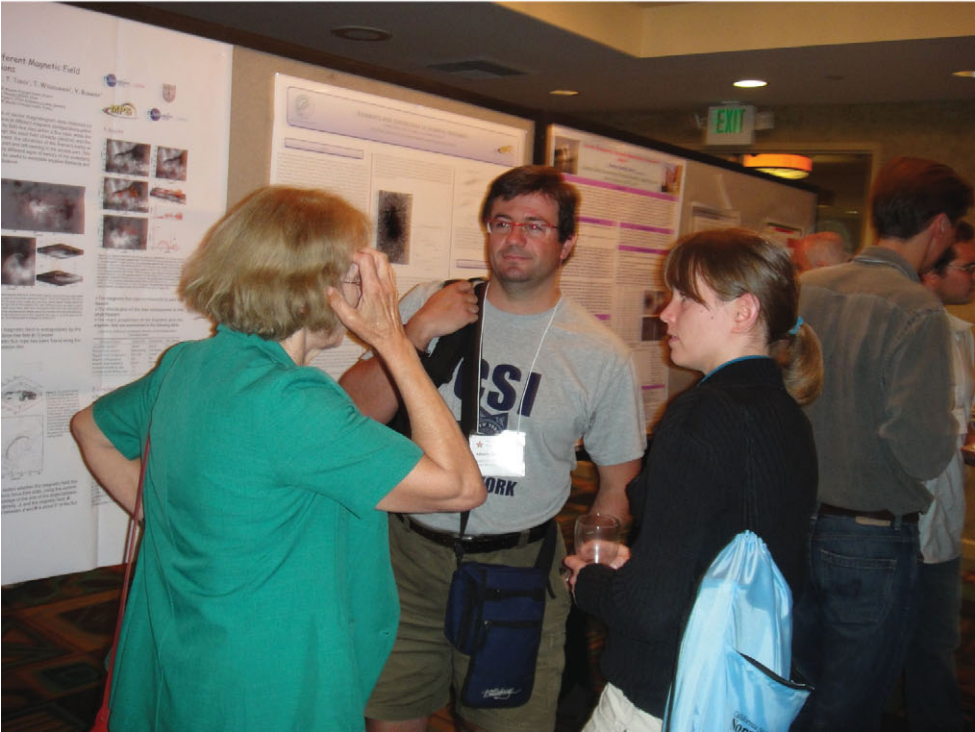
- | | | | |
|--------------------------|---------------------------|----------------------------------|--------------------|
| 1. Kamel Yassin | 31. Srikrishna Tripathy | 61. Sreejith Padinshatteeri | 91. Lokesh Bharati |
| 2. Tersi Arias | 32. Somasekhar Bagare | 62. Etienne Pariat | 92. Qiang Hu |
| 3. Arlt Rainer | 33. Sami Solanki | 63. Etienne Pariat | |
| 4. Carsten Denker | 34. KR Sivaraman | 64. Sanjiv Kumar Twari | |
| 5. Na Deng | 35. Eugene Avrett | 65. Judit Murakzy | |
| 6. Koshiaki Kato | 36. Yuan Yuan | 66. Fraser Watson | |
| 7. V.Bommier | 37. Rolf Schlichenmeier | 67. | |
| 8. Adriana Valio | 38. Jeongwoo Lee | 68. Andrs Ludmány | |
| 9. Klaus Strassmeier | 39. Shuo Wang | 69. HP Singh | |
| 10. Antonio Lanza | 40. Laurent Gizon | 70. Andrew Gascoyne | |
| 11. Douglas Brown | 41. | 71. | |
| 12. Angie Cookson | 42. Yixuan Li | 72. Zsolt Kóvári | |
| 13. Matthias Rempel | 43. | 73. J. C. Pandey | |
| 14. Durgesh Tripathi | 44. Oleg Kochukhov | 74. Shaun Bloomfield | |
| 15. Maurizio Ternullo | 45. Toshifumi Shimizu | 75. Irina Kitiashvili | |
| 16. Guillaume Aulanier | 46. Gary Chapman | 76. Manolis K. Georgoulis | |
| 17. Krisztián Vida | 47. Mark Giampapa | 77. | |
| 18. Isroil Sattarov | 48. John Hodgson II | 78. SP Rajaguru | |
| 19. Katalin Olah | 49. Brigitte Schneider | 79. Valentin Martinez Pillet | |
| 20. Jacquelynne Milingo | 50. Marcelo Lopez Fuentes | 80. Thomas Wiegelmann | |
| 21. J. C. Pandey | 51. Rudolf Komm | 81. | |
| 22. Kiran Jain | 52. | 82. | |
| 23. Debi P. Choudhary | 53. Heidi Korhonen | 83. Svetlana Berdyugina | |
| 24. Hari O Vats | 54. James Neff | 84. | |
| 25. Alexander Kosovichev | 55. Alex Brown | 85. | |
| 26. Andrea Dupree | 56. | 86. Haimin Wang | |
| 27. Nagendra Kumar | 57. | 87. Jose Carlos del Toro Iniesta | |
| 28. Arnab R. Choudhuri | 58. David Montes | 88. Jorn Warnecke | |
| 29. Moira Jardine | 59. Mikhail Demidov | 89. Matteo Cantiello | |
| 30. Sanjay Gusain | 60. Daniel Gomez | 90. Thorsten Carroll | |



Top: Adam Kowalski talks to Mark. Bottom: Ichimoto San brings out result from his computer.



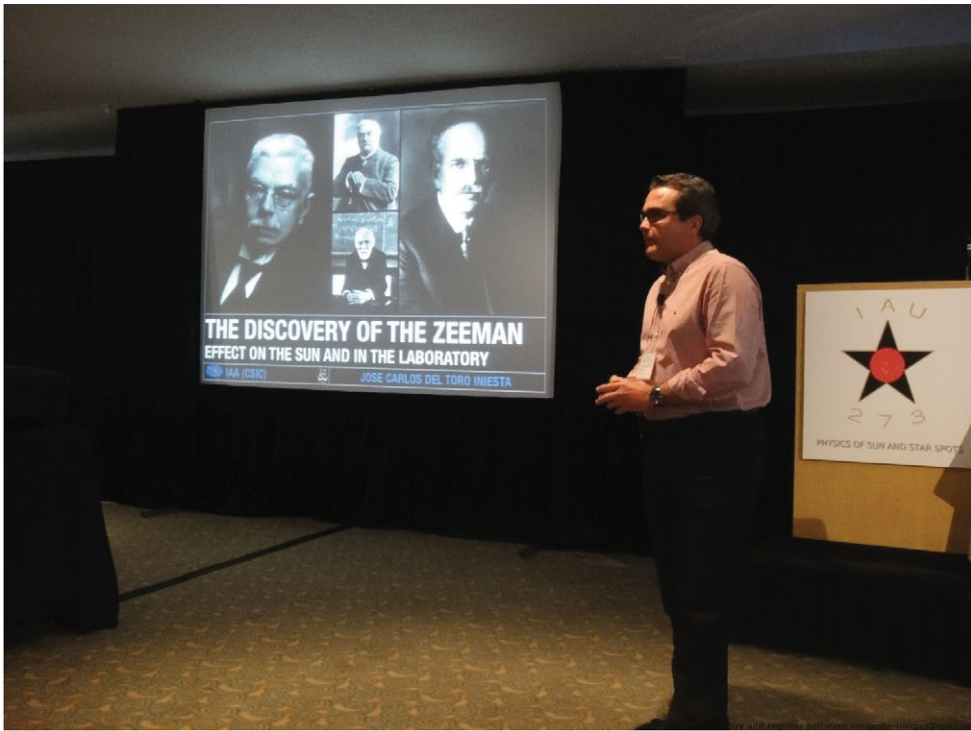
Top: Arnab Choudhuri explains to Manolis Georgoulis. Bottom: Dalda and Lucia at banquet table.



Top: Rachel Osten talks Star Spots to Steven Saar, behind them Jim Klimchuk makes a point.
Bottom: Finally Brigitte gets it!



Banquet Top: Tsuneta San's table. Bottom: Klaus and the Hungarian/Catania connection.



Top: Jose Carlos del Toro Iniesta talks about discovery of magnetic field in Sunspots by George Hale. Bottom: Gary Chapman and Debi Prasad Choudhary.

Abramenko, Valentyna, BBSO avi@bbso.njit.edu
 Andic, Aleksandra, BBSO aandic@bbso.njit.edu
 Arias, Tersi, California State University Northridge tersi.arias.25@csun.edu
 Arlt, Rainer, Astrophysikalisches Institut Potsdam rarl@aip.de
 Aulanier, Guillaume, Paris Observatory, LESIA guillaume.aulanier@obspm.fr
 Avrett, Eugene, Harvard-Smithsonian Center for Astrophysics avrett@cfa.harvard.edu
 Ayres, Thomas, University of Colorado thomas.ayres@colorado.edu
 Bagare, Somashekhar, IIAF bagare@iiap.res.in
 Barnes, Graham, NWSA/CoRA graham@cora.nwra.com
 Barnes, Sydney, Lowell Observatory barnes@lowell.edu
 Berdyugina, Svetlana, Kiepenhauer Institut fuer Sonnenphysik sveta@kis.uni-freiburg.de
 Bharti, Lokesh, Max-Planck-Institute for Solar System Research lokesh_bharti@yahoo.co.in
 Bloomfield, David, Trinity College Dublin shaun.bloomfield@tcd.ie
 Boisse, Isabelle, IAP iboisse@iap.fr
 Bommier, Vronique, LERMA, Observatoire de Paris v.bommier@obspm.fr
 Braun, Doug, NorthWest Research Assoc. dbraun@cora.nwra.com
 Brown, Alexander, University of Colorado alexander.brown@colorado.edu
 Cadavid, Ana, California State University Northridge ana.cadavid@csun.edu
 Cantiello, Matteo, Argelander Institute for Astronomy cantiello@astro.uni-bonn.de
 Carroll, Thorsten, Astrophysikalisches Institut Potsdam tcarroll@aip.de
 Chapman, Gary, San Fernando Observatory, CSU Northridge gchapman@csun.edu
 Chatterjee, Piyali, Nordita piyalic@nordita.org
 Choudhary, Debi Prasad, California State University Northridge debiprasad.choudhary@csun.edu
 Choudhuri, Arnab, Indian Institute of Science arnab@physics.iisc.ernet.in
 Christian, Damian, California State University Northridge damian.christian@csun.edu
 Cookson, Angela, San Fernando Observatory, CSU Northridge angie.cookson@csun.edu
 Crouch, Ashley, NWSA/CoRA ash@cora.nwra.com
 Del Toro Iniesta, Jose Carlos, IAA (CSIC) jti@iaa.es
 Demidov, Mikhail, Institute of Solar-Terrestrial Physics demid@iszf.irk.ru
 Deng, Na, California State University Northridge nd7@njit.edu
 Denker, Carsten, Astrophysikalisches Institut Potsdam cdenker@aip.de
 Dobias, Jan, California State University Northridge jan.dobias@csun.edu
 Dupree, Andrea, Cfa andrew.dupree@cfa.harvard.edu
 Dwivedi, Vidya, APS University, India vidya.charan2000@yahoo.com
 Featherstone, Nicholas, JILA, University of Colorado feather@nsolarz.colorado.edu
 Galsgaard, Klaus, Niels Bohr Institute kg@nbi.ku.dk
 Gascoyne, Andrew, University of Sheffield app07adg@sheffield.ac.uk
 Georgoulis, Manolis, RCAAM, Academy of Athens manolis.georgoulis@academyofathens.gr
 Giampapa, Mark, National Solar Observatory giampapa@noao.edu
 Gizon, Laurent, Max Planck Institute for Solar System Research gizon@mps.mpg.de
 Golovin, Alexander, MAO NASU, Ukraine golovin.alex@gmail.com
 Gomez, Daniel, IAFE dgomez@df.uba.ar
 Gosain, Sanjay, Udaipur Solar Observatory sgosaiw@gmail.com
 Gritcyk, Pavel, Sternberg Astronomical Institute, Lomonosov Moscow State University pgrit@inbox.ru
 Hastie, Morag, MMT Observatory mhastie@mmto.org
 Hazarika, A. B. Rajib, Diphu Govt. College, Diphu, Assam, India drabrhdgc51632@rediffmail.com
 Hodgson, John, California State University Northridge john.hodgson.71@my.csun.edu
 Hu, Qiang, CSPAR/UAHuntsville qh0001@uah.edu
 Ichimoto, Kiyoshi, Kyoto University ichimoto@kwasan.kyoto-u.ac.jp
 Jain, Kiran, National Solar Observatory kjain@noao.edu
 Jardine, Moira, University of St Andrews mmj@st-andrews.ac.uk
 Jeffers, Sandra, University of Utrecht j.v.jeffers@uu.nl
 Karak, Bidya, IISC, India bidya_karak@physics.iisc.ernet.in
 Kato, Yoshiaki, ISAS/JAXA kato.yoshiaki@isas.jaxa.jp
 Kemel, Koen, Nordita koen@nordita.org
 Khelifi, Khaled, CRAAG, Algiers, Algeria k.khelifi@craag.dz
 Kitiashvili, Irina, Stanford University irinasun@stanford.edu
 Kleint, Lucia, Institute of Astronomy, ETH Zurich kleintl@astro.phys.ethz.ch
 Klimchuk, James, NASA GSFC james.a.klimchuk@nasa.gov
 Kochukhov, Oleg, Uppsala University oleg.kochukhov@gysast.uu.se
 Komm, Rudolf, National Solar Observatory komm@nao.edu
 Korhonen, Heidi, European Southern Observatory hkorhone@eso.org
 Kosovichev, Alexander, Stanford University sasha@sun.stanford.edu
 Kóvri, Zsolt, Konkoly Observatory kovari@konkoly.hu
 Kowalski, Adam, University of Washington kowalski@astro.washington.edu
 Kuhn, Jeff, IfA/UH/Mani kuhn@ifa.hawaii.edu
 Kumar, Nagendra, M.M.H. College nagendrakg@rediffmail.com
 Kuttickat, Raju, Indian Institute of Astrophysics kpr@iiap.es.in
 Lanza, Antonio Francesco, INAF-Osservatorio Astrofisico di Catania nlanza@oact.inaf.it
 Lee, Jeongwoo, New Jersey Institute of Technology lee@njit.edu
 Lefevre, Laure, Royal Observatory of Belgium laure.lefevre@oma.be
 Li, Yixuan, New Jersey Institute of Technology y189@njit.edu
 Lindborg, Marjaana, University of Helsinki marjaana.lindborg@helsinki.fi
 Lockwood, George, Lowell Observatory gw1@lowell.edu
 Lopez Fuentes, Marcelo, Instituto de Astronomia y Fisica del Espacio lopezf@iafe.uba.ar
 Ludmny, Andrs, Heliophysical Observatory ludmany@tigris.unideb.hu
 Lukicheva, Maria, St.Petersburg University marija@peterlink.ru
 MacDonald, Gordon, California State University Northridge gordon.macdonald.31@my.csun.edu
 Mackay, Duncan, University of St Andrews duncan@mcs.st-and.ac.uk
 Marschall, Laurence, Gettysburg College marschal@gettysburg.edu
 Martin, Sara, Helio Research, USA sara@heliosearch.org
 Milingo, Jacquelynn, Gettysburg College jmilingo@gettysburg.edu
 Montes, David, UCM, Universidad Complutense Madrid dmg@astrax.fis.ucm.es
 Morin, Julien, DIAS jmorin@cp.dias.ie
 Murakozy, Judit, Konkoly Observatory murakozyj@puma.unideb.hu
 Murray, Sophie, Trinity College Dublin somurray@tcd.ie
 Nakatsukasa, Ken, California State University Northridge ken.nakatsukasa.918@my.csun.edu
 Neff, James, College of Charleston neffj@cofc.edu
 Nelson, Nicholas, JILA, University of Colorado at Boulder nnelson@lcd.colorado.edu

Nordlund, Aake, Niels Bohr Institute aake@nbi.dk
 Nunez, Marlon, Universidad de Malaga mnuez@uma.es
 Olah, Katalin, Konkoly Observatory olah@konkoly.hu
 Olshevsky, Vyacheslav, Center for Turbulence Research sya@stanford.edu
 Orozco Surez, David, National Astronomical Observatory of Japan d.orozco@nao.ac.jp
 Osten, Rachel, STScI osten@stsci.edu
 Padinhatteeri, Sreejith, ISRO Satellite Center sreejith.p@gmail.com
 Pandey, Jeewan, ARIES, Nainital jeewan.pandey@gmail.com
 Parchevsky, Konstantin, Stanford University kparchevsky@solar.stanford.edu
 Pariat, Etienne, Observatoire de Paris etienne.pariat@obspm.fr
 Pasqua, Antonio, University of Manchester, UK pasqua.antonio@yahoo.com
 Penn, Matt, National Solar Observatory mpenn@noao.edu
 Pillet, Valentin, Instituto de Astrofisica de Canarias vmp@iac.es
 Preminger, Dora, San Fernando Observatory, CSU Northridge dora.preminger@csun.edu
 Priest, Eric, St. Andrews University eric@mcs.st-and.ac.uk
 Rajaguru, Paul, Indian Institute of Astrophysics rajaguru@iiap.res.in
 Rempel, Matthias, HAO/NCAR rempel@ucar.edu
 Ren, Deqing, California State University Northridge ren.deqing@csun.edu
 Rhodes, Edward, University of Southern California erhodes@usc.edu
 Saar, Steven, SAO saar@cfa.harvard.edu
 Sainz Dalda, Alberto, Stanford-Lockheed Institute for Space Research asdalda@stanford.edu
 Sattarov, Isroil, Tashkent State Pedagogical University isattar@astrin.uzsci.net
 Savanov, Igor isavanov@rambler.ru
 Schlichenmaier, Rolf, KIS schliche@kis.uni-freiburg.de
 Schmieder, Brigitte, Observatoire de Paris brigitte.schmieder@obspm.fr
 Schrijver, Karel, Lockheed Martin ATC schryver@lmsal.com
 Sennhauser, Christian, ETH Zurich csennhau@astro.phys.ethz.ch
 Shimizu, Toshifumi, ISAS/JAXA shimizu@solar.isas.jaxa.jp
 Singh, Harinder, University of Delhi singh@iucaa.emet.in
 Sinha, Krishnanand, ARIES ksinha2000@hotmail.com
 Sivaraman, Koduvayur, Indian Institute of Astrophysics, Bangalore kr_sivaraman@yahoo.com
 Solanki, Sami, Max-Planck-Institute for Solar System Research solanki-office@mps.mpg.de
 Still, Martin, NASA Ames Research Center martin.still@nasa.gov
 Strassamier, Klaus, Astrophysical Institute Potsdam kstrassmeier@aip.de
 Ternullo, Maurizio, INAF - Osservatorio Astrofisico Catania mternullo@oact.inaf.it
 Tiwari, Sanjiv, Udaipur, Solar Observatory stiwari@prl.res.in
 Tripathi, Durgesh, University of Cambridge d.tripathi@damtp.cam.ac.uk
 Tripathi, Shreekrishna, University of California, Los Angeles tripathi@physics.ucla.edu
 Tsuneta, Saku, NAOJ saku.tsuneta@nao.ac.jp
 Valio, Adriana, Mackenzie University adrivalia@gmail.com
 Vats, Ho, Astronomy Astrophysics Division vats@pri.res.in
 Vida, Krisztin, Konkoly Observatory vidakris@konkoly.hu
 Wang, Haimin, New Jersey Institute of Technology haimin.wang@njit.edu
 Wang, Shuo, New Jersey Institute of Technology sw84@njit.edu
 Warnecke, Jrn, Nordita joern@nordita.org
 Watson, Fraser, University of Glasgow f.watson@astrolgla.ac.uk
 White, Stephen, AFRL stephen.white@kirtland.af.mil
 Wiegelmann, Thomas, MPS wiegelmann@mps.mpg.de
 Yassin, Kemal, California State University Northridge kemal.yassin.233@my.csun.edu
 Yuan, Yuan, New Jersey Institute of Technology yy46@njit.edu
 Yurchyshyn, VasyL, BBSO vayur@bbsu.njit.edu
 Zolotova, Nadezhda, Institute of Physics, St.Petersburg State University ned@geo.phys.spbu.ru

Dear Colleagues,

Recalling the observational history of sunspots led to the germ of an idea for this symposium. Even though the Chinese had records of sunspots going back hundreds of years, 2009 marked the four hundredth anniversary of their first viewing through a telescope by Galileo Galilei and Thomas Harriot. In addition, 2008 celebrated the one hundredth anniversary of George Ellery Hale's discovery of the magnetic nature of sunspots at the Mount Wilson Observatory (Los Angeles), marking the first detection of magnetism outside the Earth. It seemed natural to have a celebration of Hale's discovery in Los Angeles, but the original idea needed the impetus of a current scientific theme.

In spite of one hundred years of observational and theoretical research on solar magnetic fields, understanding the mechanisms that govern the origin and decay of sunspots is far from complete. Indeed, the delay of the onset of solar cycle 24 came as a complete surprise to the scientific community. While sunspots have been the subject of detailed studies, spots on other stars cannot yet receive the same level of scrutiny. Combining the two fields of research is mutually beneficial since solar investigations can gain perspective from the long-term evolution of stellar magnetism, and stellar research can gain insight into the root origin of spots. We hope that these proceedings not only reflect the present state of knowledge but contribute to furthering the cross-fertilization of ideas between the solar and stellar research communities. The oral presentations of the symposium were recorded and will be made available on the symposium website <http://www.csun.edu/physicsandastronomy/IAUS273/>. They are specially useful to follow the discussions at the end of each presentation.

It was a pleasure to welcome to beautiful Ventura, near Los Angeles, over 140 scientists from all over the world. Both the excellent scientific program designed by the SOC and the relaxed setting characterized by spectacular sunsets over the Pacific Ocean, lead to a stimulating and welcoming atmosphere for the exchange of ideas. The smooth and successful running of the event depended on the efficient planning and professionalism of four members of the LOC: Angie Cookson, John Hodgson, Debbie Klevens and Dora Preminger. To them goes our deep appreciation.

We are also extremely grateful for the essential financial support from the following agencies: The National Science Foundation in the Atmospheric Sciences and the Astronomy divisions; the NASA Living with a Star Program; the College of Science and Mathematics and the Office of Research and Sponsored Projects at California State University Northridge. On the final day of the symposium, forty participants took the two and a half hour trip to the Mount Wilson Observatory. There they toured the research-active 60-foot and 150-foot solar towers, as well as the historic Hooker 100-inch telescope and the Snow solar telescope. Walking through the facilities designed and used by Hale was, for some, a brush with the past, bringing deeper significance to their present day work.

Ana Cristina Cadavid, Debi Prasad Choudhary, Klaus G. Strassmeier
March 2011