SPECTRO-POLARIMETRY WITH THE HIGHEST POSSIBLE POLARIMETRIC PRECISION IS NEEDED TO DIAGNOSE SOLAR MAGNETIC FIELDS IN THE SPATIALLY UNRESOLVED DOMAIN. IN SPITE OF GREAT ADVANCES IN TELESCOPE RESOLUTION, MOST MAGNETIC STRUCTURES ON THE SUN REMAIN UNRESOLVED. THE AVERAGE PROPERTIES OF THESE SMALL-SCALE FIELDS MAY AFFECT THE PHYSICS OF THE SOLAR ATMOSPHERE AT LARGE SCALES. OBSERVABLE SIGNATURES OF THE UNRESOLVED DOMAIN CAN BE IDENTIFIED IN ENSEMBLE AVERAGES OF HIGH-PRECISION RECORDINGS OF POLARIZED LINE PROFILES. THE FIGURE GIVES AN OVERVIEW OF THE SCALE SPECTRUM OF SOLAR MAGNETIC FIELDS.

From the contribution of J.O. Stenflo in the present proceedings.
ASTRONOMICAL SOCIETY OF THE PACIFIC
CONFERENCE SERIES

Volume 489

SOLAR POLARIZATION 7

Proceedings of a workshop held at
Expo Garden Hotel, Kunming, China
9–13 September 2013

Edited by

K. N. Nagendra
Indian Institute of Astrophysics, Bangalore-560 034, India

J. O. Stenflo
Institute of Astronomy, ETH Zurich, CH-8093 Zurich, Switzerland,
Istituto Ricerche Solari Locarno, Via Patocchi, CH-6605 Locarno Monti, Switzerland

Z. Q. Qu
Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming 650011,
Yunnan Province, P.R. China

M. Sampoorna
Indian Institute of Astrophysics, Bangalore-560 034, India

SAN FRANCISCO
Contents

Preface ......................................................... ix
Organizers .................................................. xi
Participants ............................................... xiii
Conference Photograph ................................. xviii

Session I. Quiet-Sun Magnetic Fields
Chair: K. N. Nagendra

Nature of Quiet-Sun Magnetic Fields ......................... 3
J. O. Stenflo

Conversion of the 6302 / 6301 Stokes V Line Ratio to the 5250 / 5247 Ratio for the Diagnostics of Quiet-Sun Magnetic Fields ............ 21
M. L. Demidov, J. O. Stenflo, M. Bianda, and R. Ramelli

Session II. Active-Region Magnetic Fields
Chair: M. L. Demidov

The Magnetic Configuration of a δ-Spot ...................... 39
H. Balthasar, C. Beck, R. E. Louis, M. Verma, and C. Denker

Transverse Oscillation of a Filament Triggered by an Extreme Ultraviolet Wave ........................................... 53
Z. K. Xue, X. L. Yan, Z. Q. Qu, and L. Zhao

Computation of the Potential Magnetic Field in Solar Active Regions ............. 59
V. Sadykov and I. Zimovets

Session III. Measurements of Magnetic and Electric Fields
Chairs: M. L. Demidov and J. Trujillo Bueno

Magnetic and Electric Field Diagnostics of Chromospheric Jets by Spectropolarimetric Observations of the H\textsc{i} Paschen Lines .......... 67
T. Anan, R. Casini, and K. Ichimoto
Contents

Understanding the Chromospheric Magnetic Field ........................................ 77
C. L. Jin, J. W. Harvey, and A. Pietarila

Evolution of Small Scale Magnetic Structures from Sunrise Data .................. 83
L. S. Anusha, A. Feller, J. Hirzberger, and S. K. Solanki

Diagnostic of Chromospheric Magnetic Fields with the Mg b2 Line .............. 89
X. Y. Bai, Y. Y. Deng, J. T. Su, and F. Teng

Session IV. Physics of Scattering Polarization
Chair: J. Trujillo Bueno

Theoretical Schemes for the Interpretation of Solar Polarimetric Observations:
An Overview and Some New Ideas ............................................................ 99
E. Landi Degl’Innocenti and L. Belluzzi

Non Coherent Continuum Scattering as a Polarization Mechanism of the
Enigmatic Ba II D1 Line ................................................................. 107
T. del Pino Alemán, J. Trujillo Bueno, and H. Uitenbroek

Electron Scattering Redistribution Effect on Atomic Line Polarization .......... 117
H. D. Supriya, K. N. Nagendra, B. Ravindra, and M. Sampoorna

Intrinsically Polarized Blend Lines ....................................................... 125
K. Sowmya, K. N. Nagendra, and M. Sampoorna

On the Origin of Linear Polarization in Solar Flares ................................. 133
J. Štěpán and P. Heinzel

Session V. Solar Diagnostics with Scattering Polarization
Chair: V. Bommier

Polarized Radiation Observables for Probing the Magnetism of the Outer Solar
Atmosphere ............................................................... 137
J. Trujillo Bueno

Inferring Depth-Dependent Quiet Sun Magnetic Fields ............................... 157
I. Milić and M. Faurobert

Solar Cycle Variations of the Second Solar Spectrum ................................ 167
M. Bianda, R. Ramelli, D. Gisler, and J. O. Stenflo

Session VI. Polarized Radiative Transfer with Frequency Redistribution
Chairs: V. Bommier and E. Landi Degl’Innocenti

Partial Redistribution Theory and its Applications in the Interpretation of the
Second Solar Spectrum ............................................................. 179
K. N. Nagendra
XTAT: A New Multilevel-Multiline Polarized Radiative Transfer Code with PRD .................................................. 195
  V. Bommier
Polarized Line Formation with Angle-Dependent Partial Frequency Redistribution ........................................ 197
  M. Sampoorna
The Role of Quantum Interference and Partial Redistribution in the Solar Ba II D₂ 4554 Å Line .......................... 213
  H. N. Smitha, K. N. Nagendra, J. O. Stenflo, and M. Sampoorna

Session VII. Multi-Dimensional Polarized Radiative Transfer
Chairs: E. Landi Degl’Innocenti and Z. Q. Qu

Multi-Dimensional Polarized Radiative Transfer:
  Methods and Solar Applications ........................................ 225
  L. S. Anusha and K. N. Nagendra
PORTA: A Massively Parallel Code for 3D Non-LTE Polarized Radiative Transfer ........................................ 243
  J. Stépán

Session VIII. Ground-Based Instrumentation Projects
Chairs: Z. Q. Qu and J. X. Wang

From NVST to CGST .......................................................... 247
  Z. Liu
Prototype FASOT .............................................................. 263
Fast Solar Polarimeter: Description and First Results .......................................................... 271
Polarization Calibration of the Advanced Technology Solar Telescope ............................................... 279
  D. F. Elmore
Reducing Birefringence Uncertainty in the Design of ATST Polarization Components ................................ 289
  S. R. Sueoka
Polarization Model for the New Vacuum Solar Telescope ............................................................. 297
  S. Yuan
Contents

Session IX. Recent Projects in Spectro-Polarimetry
Chairs: J. X. Wang and D. F. Elmore

A Sounding Rocket Experiment for the Chromospheric Lyman-Alpha Spectro-Polarimeter (CLASP) 307
M. Kubo, R. Kano, K. Kobayashi, T. Bando, N. Narukage, R. Ishikawa,
S. Tsuneta, Y. Katsukawa, S. Ishikawa, Y. Suematsu, H. Hara, T. Shimizu,
T. Sakao, K. Ichimoto, M. Goto, T. Holloway, A. Winebarger, J. Curtain,
B. De Pontieu, R. Casini, F. Auchère, J. Trujillo Bueno, R. Manso Sainz,
L. Belluzzi, A. Asensio Ramos, J. Štěpán, and M. Carlsson

Precision VUV Spectro-Polarimetry for Solar Chromospheric Magnetic Field Measurements 319
R. Ishikawa, T. Bando, H. Hara, S. Ishikawa, R. Kano, M. Kubo, Y. Katsukawa,
T. Kobiki, N. Narukage, Y. Suematsu, S. Tsuneta, K. Aoki, K. Miyagawa,
K. Ichimoto, K. Kobayashi, F. Auchère, and the CLASP team

A Progress Update for the CORonal Solar Magnetism Observatory for Coronal
and Chromospheric Polarimetry 323
A. G. de Wijn, S. Tomczyk, and J. Burkepile

Spectropolarimetry and Type Ia Supernovae 337
B. Wang and D. Liu

Author Index 341
Preface

The 7th Solar Polarization Workshop (SPW7) that took place in Kunming, the spring city of China, during September 9–13, 2013, is part of a series of international workshops on ‘Solar Polarization’. SPW7 was held at the Expo Garden Hotel, which is located in the northeast section of downtown of Kunming, about 8 km from the Yunnan Astronomical Observatory.

The series of Solar Polarization Workshops (SPWs) provide a platform for scientists from all over the world to come together to address foundational aspects on spectro-polarimetry of the Sun, including its applications in stellar astrophysics. These Workshops have taken place on average every 3 years in different parts of the world, starting in St. Petersburg (Russia) in 1995, followed by Bangalore (India; 1998), Tenerife (Spain; 2002), Boulder (USA; 2005), Ascona (Switzerland; 2007), and Maui (Hawaii; 2010), each representing a milestone in this rapidly evolving field of astrophysics.

The primary purpose of the SPWs has been to explore the Sun and its magnetic field with the tools of spectro-polarimetry. The theoretical aspects deal with the physics of the interaction of radiation and matter in magnetized media, the formation of polarized atomic and molecular spectral lines through the Zeeman, Hanle, magneto-optical, and Paschen-Back effects, coherent scattering, and with polarized radiative transfer that includes these various effects together with hyperfine structure, quantum interferences, optical pumping, and partial frequency redistribution. The observational aspects concern the design and operation of high-precision imaging Stokes polarimeters, choice of observing parameters and strategies for trade-offs between resolutions (angular and spectral) and polarimetric precision, diagnostic techniques to minimize model dependence (use of differential effects like line ratios for the Hanle and Zeeman effects), strategies for data inversion, or the definition and initiation of synoptic programs for the Hanle effect.

Like previous SPWs the meeting brought together specialists representing various subdisciplines, which allowed very constructive interactions. There was a high attendance of young scientists. The scientific program was structured in topical sessions that addressed the various diverse aspects of solar polarization. A list of the sessions with the names of the respective Chairpersons appear in the Table of Contents. All the oral presentations were considered as invited talks. Depending on the nature of the talk there were two choices of time allocations, 45 min or 30 min (including 10 min discussion time in both cases). The longer talks represented either in-depth presentations of own work or reviews of the given topic. There were also a number of interesting poster presentations, which remained in the poster area throughout the workshop for viewing and discussion. All three types of presentations are published as articles in the present proceedings volume. At the end of some conference days we had a period of “Guided Discussions” with the primary aim of allowing for extended discussions and interactions in an informal atmosphere. The present volume is interspersed with photos taken during the conference week by LOC, Jan Stenflo, L. S. Anusha, and M. Sampoorna.

We are thankful to SOC for having come up with a balanced and attractive scientific program. Our thanks also go to the Chairpersons of all the sessions and in particular to the Referees for their extensive work, which has greatly contributed to the high quality of the present proceedings volume.
As part of the SPW7 program there were visits to (i) the headquarters of the Yunnan Astronomical Observatory (in particular to see the prototype of the Fiber Arrayed Solar Optical Telescope FASOT), and (ii) the Fuxian Solar Observatory with its 1 m vacuum solar telescope at a beautiful lakeside location. Both the academic and sight-seeing visits and cultural programs during the conference were excellent.

The successful organizational work by LOC was led by Zhongquan Qu, who also took great care to organize all the various kinds of financial support, including the funds required for the publication of the present proceedings volume, and support for participation of younger scientists and for those with particular needs. The LOC was assisted by a dedicated and efficient team at Yunnan Astronomical Observatory, National Astronomical Observatory, Nanjing University, Beijing University, and Yunnan Normal University. We are grateful to all the members of LOC for their enthusiastic and dedicated groundwork that made the SPW7 Workshop such a success. The research group ‘Fiber Arrayed Solar Optic Telescope, FASOT’ of Yunnan Astronomical Observatory organized and efficiently maintained the SPW7 home page. The workshop was jointly sponsored by the National Science Foundation of China (NSFC) and the Chinese Academy of Sciences (CAS).

The participation, excellent talks, and lively discussions generated during the conference made it a memorable event. We are grateful to all the participants who came from so many different parts of the world for their various contributions.

Finally we would like to thank the ASP Editorial staff for their cooperation and help in the publication of this SPW7 proceedings book, which we hope will remain a landmark in the history of the SPW Workshop series.

K. N. Nagendra, J. O. Stenflo, Zhongquan Qu, M. Sampoorna
Organizers

Scientific Organizing Committee
S. V. Berdyugina (Kiepenheuer Institute for Solar Physics, Freiburg, Germany)
V. Bommier (Observatoire de Paris, Meudon, France)
D. F. Elmore (National Solar Observatory, Sunspot, NM, USA)
A. Gandorfer (Max-Planck Institute for Solar System Research, Germany)
K. Ichimoto (Kyoto University, Japan)
C. U. Keller (Leiden Observatory, The Netherlands)
J. Kuhn (Institute for Astronomy, Hawaii, USA)
E. Landi Degl’Innocenti (Università di Firenze, Italy)
K. N. Nagendra (Indian Institute of Astrophysics, Bengaluru, India)
Z. Q. Qu (Yunnan Astronomical Observatory, CAS, Kunming, China)
J. O. Stenflo (Institute of Astronomy, ETH Zurich, Switzerland – Chair )
J. Trujillo Bueno (Instituto de Astrofisica de Canarias, Tenerife, Spain)

Advisory Board
C. Fang (Nanjing University, China)
Z. W. Han (Yunnan Astronomical Observatory, CAS, Kunming, China)
P. W. Ji, G. X. Dong (National Science Foundation of China NSFC)
J. X. Wang (National Astronomical Observatories, CAS, Beijing, China)

Local Organizing Committee
Z. Q. Qu (Chair), J. Lin (Vice Chair), Z. Liu (Vice Chair), L. Chang, X. M. Cheng,
L. H. Deng, G. T. Dun, H. Li, L. Ma, L. Ni, Z. N. Qu, W. Song, B. Wang, J. C. Xu,
Z. Xu, Z. K. Xue, X. L. Yan, L. Zhao, X. J. Zhao
(Yunnan Astronomical Observatory, CAS, Kunming, China)
D. G. Wang (Vice Chair), C. L. Jin, F. Teng, X. F. Wang
(National Astronomical Observatory, CAS, Beijing, China)
Y. Guo (Nanjing University, China)
H. F. Liang, C. L. Xu (Yunnan Normal University, China)
Participants

TETSU ANAN, Kyoto University, Hida Observatory, Kurabashira, Kamitakara-cho, Takayama, Gifu 506-1314, Japan ⟨anan@kwasan.kyoto-u.ac.jp⟩

LOKANATHAPURA S. ANUSHA, Max-Planck-Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany ⟨bhasari@mps.mpg.de⟩

XIANYONG BAI, National Astronomical Observatories, Huairou Solar Observing Station, Chinese Academy of Sciences, 20A Datun Road, Chaoyang, Beijing 100102, China ⟨xybai@bao.ac.cn⟩

HORST BALTHASAR, Leibniz-Institute für Astrophysik Potsdam, An der Sternwarte 16, 14482 Potsdam, Germany ⟨hbalthasar@aip.de⟩

LUIS BELOT RUBIO, Instituto de Astrofísica de Andalucía, Glorieta de la Astronomía s/n, E-18008 Granada, Spain ⟨lbellot@iaa.es⟩

MICHELE BIANDA, Istituto Ricerche Solari Locarno, via Patocchi 57, CH-6605 Locarno, Switzerland ⟨mbianda@irsol.ch⟩

VÉRONIQUE Bommier, LESIA, Observatoire de Paris, CNRS-INSU-UMR 8109, UPMC Univ. Paris 6, Université Paris Diderot-Paris 7, 5 place Jules Janssen, 92190 Meudon, France ⟨V.Bommier@obspm.fr⟩

LIANG CHANG, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming, Yunnan 650011, China ⟨changliang@ynao.ac.cn⟩

ALFRED DE Wijn, High Altitude Observatory, National Center for Atmospheric Research, 3090 Center Green Drive, Boulder, CO 80301, USA ⟨dwijn@ucar.edu⟩

TANAUSÚ DEL PINO ALEMÁN, Instituto de Astrofísica de Canarias, vía Láctea s/n, 38205 La Laguna, Tenerife, Spain ⟨tanausu@iac.es⟩

MIKHAIL DEMIDOV, Institute of Solar-Terrestrial Physics, Siberian Branch, Russian Academy of Sciences, PO Box 291, Lermontov str. 125-a, 664033 Irkutsk, Russia ⟨demid@iszf.irk.ru⟩

LINHUA DENG, Yunnan Astronomical Observatory, Chinese Academy of Sciences, P.O. Box 110, Kunming, Yunnan 650011, China ⟨bench@ynao.ac.cn⟩

YUANYONG DENG, Key Laboratory of Solar Activity, National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China ⟨dyy@nao.ac.cn⟩

GUANGTAO DUN, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming, Yunnan 650011, China ⟨dgtlc@ynao.ac.cn⟩

DAVID F. ELMORE, National Solar Observatory, 3665 Discovery Drive, Boulder, CO 80304, USA ⟨elmore@nso.edu⟩

CHENG FANG, Nanjing University, 22 Han Kou road, Nanjing 210093, China ⟨fangc@nju.edu.cn⟩

ALEX FELLER, Max-Planck-Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany ⟨feller@mps.mpg.de⟩

ACHIM GANDORFER, Max-Planck-Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany ⟨gandorfer@mps.mpg.de⟩
Participants

MOTOSHI GOTO, National Institute for Fusion Science, Toki, Gifu 509-5292, Japan (goto@nifs.ac.jp)

YANG GUO, Nanjing University, Hankou Road 22, Nanjing 210093, Jiangsu Province, China (guoyang@nju.edu.cn)

WOJTEK HAJDAS, Paul Scherrer Institute, CH-5232 Villigen PSI, Switzerland (wojtek.hajdas@psi.ch)

JUNFENG HOU, Key Laboratory of Solar Activity, National Astronomical Observatories of Chinese Academy of Sciences, 20A Datun Road, Chaoyang District, Beijing 100012, China (jfhou@bao.ac.cn)

KIYOSHI ICHIMOTO, Kyoto University, Hida Observatory, Kurabashira Kamitakara-cho, Takayama-city, Gifu 506-1314, Japan (ichimoto@kwasan.kyoto-u.ac.jp)

FRANCISCO IGLESIAS, Max-Planck-Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany (iglesias@mps.mpg.de)

RYOHKO ISHIKAWA, National Astronomical Observatory of Japan, Osawa 2-21-1, Mitaka 181-8588, Japan (ryoko.ishikawa@nao.ac.jp)

HAISHENG JI, Purple Mountain Observatory, Chinese Academy of Sciences, Nanjing 210008, China (jihp@pmo.ac.cn)

CHUNLAN JIN, Huaireou Solar Observing Station, National Astronomical Observatories, Chinese Academy of Sciences, 20A Datun Road, Chaoyang, Beijing 100012, China (cljin@nao.cas.cn)

TOMOKO KAWATE, Hida Observatory, Kyoto University, Kurabashira, Kamitakara-cho, Takayama, Gifu 506-1314, Japan (kawate@kwasan.kyoto-u.ac.jp)

HYUNNAM KIM, Kyung Hee University, 1 Seocheon-dong, Giheung-gu, Yongin, Gyeonggi-do 446-701, Republic of Korea (astrokhn@khu.ac.kr)

MASAHITO KUBO, National Astronomical Observatory of Japan, Osawa 2-21-1, Mitaka 181-8588, Japan (masahito.kubo@nao.ac.jp)

EGIDIO LANDI DEGL’INNOCENTI, Dipartimento di Fisica e Astronomia, Università di Firenze, Largo E. Fermi 5, I-50125 Firenze, Italy (landie@arcetri.astro.it)

HAO LI, Yunnan Astronomical Observatory, Chinese Academy of Sciences, P.O.Box 110, Kunming, Yunnan 650011, China (sayahoro@ynao.ac.cn)

YAN LI, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming, Yunnan 650011, China (liyan821@ynao.ac.cn)

HONGFEI LIANG, Yunnan Normal University, Kunming 650092, China (lhf@ynao.ac.cn)

JUN LIN, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming, Yunnan 650011, China (jlin@ynao.ac.cn)

ZHONG LIU, Yunnan Astronomical Observatory, Chinese Academy of Sciences, P.O.Box 110, Kunming, Yunnan 650011, China (lz@ynao.ac.cn)

LIN MA, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming, Yunnan 650011, China (malin-567@ynao.ac.cn)

ZHIXING MEI, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming, Yunnan 650011, China (meizhixing@ynao.ac.cn)
Participants

IVAN MILIC, Astronomical observatory Belgrade, Volgina 7, 11060, Belgrade, Serbia  
(milic@aob.rs)

GRAHAM MURRAY, Durham University, 2 Wardles Terrace, Allergate, Durham DH1 3LE, UK  
(g.j.murray@durham.ac.uk)

KANAKATTE N. NAGENDRA, Indian Institute of Astrophysics, IInd block, Koramangala,  
Bengaluru 560 034, India  
(knn@iiap.res.in)

LEI NI, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming,  
Yunnan 650011, China  
(leini@ynao.ac.cn)

ZHINING QU, Yunnan Astronomical Observatory, Chinese Academy of Sciences,  
Kunming, Yunnan 650011, China  
(znqu@ynao.ac.cn)

ZHONGQUAN QU, Yunnan Astronomical Observatory, Chinese Academy of Sciences,  
Kunming, Yunnan 650011, China  
(zqqu@ynao.ac.cn)

VIACHESlav Sadykov, Space Research Institute, Russian Academy of Science,  
Profsoyuznaya Str. 84/32, Moscow, 117997 Russia  
(viacheslav.sadykov@gmail.com)

MALALI Sampoorna, Indian Institute of Astrophysics, IInd block, Koramangala,  
Bengaluru 560 034, India  
(sampoorna@iiap.res.in)

YUANDENG SHEN, Yunnan Astronomical Observatory, Chinese Academy of Sciences,  
Kunming, Yunnan 650011, China  
(ydshen@ynao.ac.cn)

WEI SONG, Yunnan Astronomical Observatory, Chinese Academy of Sciences, P.O.Box  
110, Kunming, Yunnan 650011, China  
(wsong@ynao.ac.cn)

JAN O. STENFLO, Institute of Astronomy, ETH Zurich, CH-8093 Zurich, Switzerland  
(stenflo@astro.phys.ethz.ch)

JIRI STEPAN, Astronomical Institute ASCR, Fričova 298, 251 65 Ondřejov, Czech  
Republic  
(stepan@asu.cas.cz)

STACEY R. SUEOKA, College of Optical Sciences, University of Arizona, 1630 E.  
University Blvd., Tucson, AZ 85719, USA  
(ssueoka@optics.arizona.edu)

FEI TENG, Huairou Solar Observing Station, National Astronomical Observatories,  
Chinese Academy of Sciences, Datun Road 20A, Chaoyang, Beijing 100012,  
China  
(tengfei@lsec.cc.ac.cn)

JAVIER TRUJILLO BUENO, Instituto de Astrofísica de Canarias, vía Láctea s/n, 38205 La  
Laguna, Tenerife, Spain  
(jtb@iac.es)

MICHIEL VAN NOORT, Max-Planck-Institut für Sonnensystemforschung,  
Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany  
(vannoort@mps.mpg.de)

BO WANG, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Phoenix  
Mountain, East Suburb, Kunming, Yunnan 650011, China  
(wangbo@ynao.ac.cn)

DONGGUANG WANG, Key Laboratory of Solar Activity, National Astronomical  
Observatories, Chinese Academy of Sciences, Beijing 100012, China  
(wdg@bao.ac.cn)

JINGXIU WANG, Key Laboratory of Solar Activity, National Astronomical  
Observatories, Chinese Academy of Sciences, 20A Datun Road, Chaoyang,  
Beijing 100012, China  
(wangjx@nao.cas.cn)
Participants

XIAOFAN WANG, Huairou Solar Observing Station, National Astronomical Observatories, Chinese Academy of Sciences, 20A Datun Road, Chaoyang, Beijing 100012, China (wxf@nao.cas.cn)

JINGLAN XIE, Yunnan Astronomical Observatory, Chinese Academy of Sciences, P.O. Box 110, Kunming, Yunnan 650011, China (xiejinglan@ynao.ac.cn)

CHENGLIN XU, Yunnan Normal University, 298, 121 Street, Kunming, Yunnan 650500, China (xcl815@163.com)

JINGCHEN XU, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming, Yunnan 650011, China (jcxu@ynao.ac.cn)

ZHI XU, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming, Yunnan 650011, China (xuzhi@ynao.ac.cn)

ZHIKE XUE, Yunnan Astronomical Observatory, Chinese Academy of Sciences, Guandu District, Kunming, Yunnan 650011, China (zkxue@ynao.ac.cn)

LEI YAN, Peking University, remote sensing building, yihuyuan road, haidian district, Beijing 100871, China (lyan@pku.edu.cn)

XIAOLI YAN, Yunnan Astronomical Observatory, Chinese Academy of Sciences, P.O. Box 110, Kunming, Yunnan 650011, China (yanxl@ynao.ac.cn)

BIN YANG, Peking University, Remote Sensing Building, Haidian District, Beijing 100871, China (ybjason89@163.com)

SHU YUAN, Yunnan Astronomical Observatory, Chinese Academy of Sciences, P.O.Box 110, Kunming, Yunnan 650011, China (yuanshu@ynao.ac.cn)