

RECENT INSTRUMENTAL DEVELOPMENTS IN SOLAR PHYSICS AT THE INSTITUTO DE ASTROFÍSICA DE CANARIAS

I. Rodríguez Hidalgo¹

¹Instituto de Astrofísica de Canarias, La Laguna, Tenerife, Spain

ABSTRACT

This contribution correspond to the report presented within the Section devoted to Working Group no. 2 (Solar Observing Techniques) of the JOSO Annual Meeting.

The main spanish "hits" in solar instrumentation during the past year are briefly reviewed. They refer to the upgrading of facilities for the Vacuum Newton Telescope (VNT) of the Observatorio del Teide (OT, Tenerife), and two full Stokes Polarimeters developed at the IAC (Instituto de Astrofísica de Canarias): LPSP, La Palma Stokes Polarimeter, and TIP, Tenerife Infrared Polarimeter.

Key words: solar instrumentation; visible and infrared photometry; visible and infrared spectropolarimetry.

and basic image treatment, as enlargement/reduction of desired areas or contrast adjustment for a better visualization. Other possibilities are the automatic change of exposure time and selection of the filter to be used. More details can be found in Gago et al. (1999).

At the moment, the first detector above mentioned is installed and working at the VNT. It is intended for a long-term observational program for obtaining sunspots images at $1.6 \mu\text{m}$, with the aim of checking whether there is actually an umbral brightening along the solar cycle.

Finally, as part of the VNT upgrading, a new auxiliary telescope (6 cm of diameter, 60 cm of focal length) is available which, together with the visible camera, will be definitively assembled in October 1999. It has been designed to obtain whole Sun images at different wavelengths: three broad-band (blue, green, red), G band, and CaII K (10 and 3 Å half-width).

1. Acquisition System of Solar Images

SAIS II, succesfully tested at the VNT in June 1998, stands for Sistema de Adquisición de Imágenes Solares (Acquisition System of Solar Images). It is a combination of hardware and software allowing to obtain images from 3 different cameras which can be connected to the computer through the corresponding acquisition board. The computer used is a PC Pentium II (3.2 Gb disk, CD-ROM, Windows NT). The design includes a common user-interface for the 3 cameras, differing only in certain features, particular of each instrument.

The three detectors are: (i) Infrared detector Su128-1.7RT: 128×128 px of $60 \times 60 \mu\text{m}$; spectral response: 0.9 to $1.7 \mu\text{m}$ (ii) Infrared detector NICMOS-3: 256×256 px of $40 \times 40 \mu\text{m}$; spectral response: 1 to $2.5 \mu\text{m}$ (iii) Visible detector DALSA: 1024×1024 px of $12 \times 12 \mu\text{m}$; spectral response: visible range

Among the different options offered by this system are: visualization of live images, which can be 'frozen', stored in hard disk and recovered from it; obtention of statistics of selected zones; automatic selection of images; real time correction for dark current and flatfield (by using previously stored frames);

2. Visible and IR Polarimeters for the Canarian Observatories

At the IAC, in collaboration with the Royal Swedish Academy of Sciences and the Kiepenheuer Institut für Sonnenphysik, two full Stokes polarimeters have been designed and developed: LPSP for visible wavelengths (first light at the Swedish Vacuum Solar Telescope -SVST of the Observatorio del Roque de Los Muchachos -ORM in September 1998), and TIP for the near IR range (first light at the Vacuum Tower Telescope -VTT of the OT in July 1998).

The analyzers measure all 4 Stokes parameters almost simultaneously using a modulation scheme based on Ferroelectric Liquid Crystals (FLCs), that is, electro-optical devices with a fixed retardance and an optical axis that can be alternated between two orientations as a function of an externally applied voltage. Four images corresponding to 4 different states of the FLCs are needed to measure the whole Stokes vector, and a number of exposures for each of those states can be added to improve the S/N ratio.

Both polarimeters are composed of: (i) a mechanical shutter (for dark current measurements); (ii) a UV filter to protect the FLCs; (iii) a pair of FLCs,

driven by a simple DC square wave with an amplitude of 10-15 volts.; and (iv) a polarizing beamsplitter composed of 2 calcite blocks, in order to reduce the so-called seeing-induced crosstalk and to double the number of detected photons.

The efficiencies of the analyzers in determining each one of the Stokes parameter (see Sánchez Almeida et al. (1994) for a definition) are related to the properties of the FLCs (retardances, which are a function of the wavelength, orientations and temperature). A number of tests and simulations have been carried out at the laboratory and the telescopes, showing that the IAC analyzers are indeed efficient in measuring polarization, with values close to the optimum ones. For more details, see Martínez Pillet et al. (1999) and Collados (1999).

The two polarimeters use calibration units (consisting of a linear polarizer and a quarter wave retarder which can be rotated independently) to calibrate the performance of the analyzer by generating known polarization states. They allow to obtain the corresponding polarimeter modulation matrix, and to take into account all the instrumental polarization effects induced by the optical elements between the calibration system and the analyzer itself, located behind the slit in both cases. Finally, both polarimeters have re-imaging optics to adjust the pixel size to the right sampling and increase the amount of photons reaching each pixel.

Two-dimensional maps of Stokes I , Q , U , and V can be obtained with LPSP and TIP, by scanning the spatial direction perpendicular to the slit with the aid of the correlation tracker. All the components of the polarimeters, the elements needed for the scanning mode, and their operations are controlled from DEC-alpha workstations (400 Hz) through a user-interface developed at the IAC.

LPSP and TIP are similar except for the different sensitivity to wavelength of the FLCs and detectors used. Other distinct features, related to the telescope, the calibration optics and the re-imaging system, are commented below.

2.1. La Palma Stokes Polarimeter

The nominal wavelength (λ_0) of LPSP is 6300 Å, but a larger usable range is attainable by using 2 pairs of temperature controlled FLCs, for the ranges 4500-5800 Å and 5800-7500 Å, respectively.

The modulation frequency is 15 Hz and a number of 67 images for each of the 4 modulation states are accumulated to obtain a S/N ratio of about 10^3 .

The instrumental calibration unit is located between the exit window and the entrance slit, inside a vacuum chamber before all the correlation tracker components. LPSP uses as re-imaging optics 2 cylindrical lenses. Only the focal length in the spatial direction is reduced by a factor of 2, keeping the same focal length in the spectral direction.

The detector used by LPSP is a CHIL-CCD camera with 755×242 px of 8.5 μm ×19.75 μm (spatial×spectral direction).

A field of view is 60'' × 60'' can be scanned in about 30 minutes. The spectral range at λ_0 is 4.3 Å, with a pixel size of 0.157''×17.95 mÅ.

During the 1999 summer, the first observational campaigns with LPSP@SVST have been scheduled and carried out. As an example of the performance of LPSP, its first light can be seen in Fig. 1.

2.2. Tenerife Infrared Polarimeter

TIP has been designed for a wavelength range from 1 to 2.3 μm . Presently, a pair of FLCs is installed, valid for the H band (1.5 to 1.8 μm , $\lambda_0=1.56 \mu\text{m}$). Tests, first light and the first observational campaigns (during the summer of this year) have been carried out within this range. Two more pairs of FLCs, for the J (1 to 1.5 μm) and K (1.8 to 2.3 μm) bands have already been purchased and tested at the laboratory. After some tests at the VTT, they are expected to be installed and ready for the 2000 observing time.

In this case, the modulation frequency is 2 Hz, and a S/N ratio close to 103 is obtained after accumulating 10 images for each of the 4 modulation states.

The calibration unit is located between the telescope exit window and the entrance slit, inside the correlation tracker tank and before all its optical components. As re-imaging optics, TIP uses 2 spherical lenses which reduce both the focal lengths in the spatial and spectral directions by a factor of 2.

The detector used by TIP is a NICMOS-3 IR detector, with 256×256 px of 40 μm ×40 μm .

A field of view is 40'' × 40'' can be scanned in about 10 minutes, at steps of 0.4''. The spectral range at λ_0 is 7.4 Å, with a pixel size of 0.37''×29 mÅ.

An example of a penumbra observed with TIP can be seen in Fig. 2.

REFERENCES

- Collados, M. 1999, in *3rd Advances in Solar Physics Euroconference: Solar magnetic fields and oscillations* (eds.) Schmieder, B., Hoffmann, A. & Staude, J., Astron. Soc. Pacific Conf. Series
- Gago, F., Joven, E., Reyes, M., & González, V. 1999, User Manual of SAIS II, IAC internal technical report
- Martínez Pillet, V., Collados, M., Sánchez Almeida, J., González, V., Cruz-López, A., Manescau, A., Joven, E., Páez, E., Díaz, J.J., Feeney, O., & Sánchez, V. 1999, in *High Resolution Solar Physics: Theory, Observations and Techniques*, 19th NSO/Sacramento Peak Summer Workshop, (eds.) Rimmele, T. & Balasubramaniam, K.S.
- Sánchez Almeida, J., Collados, M., & Martínez Pillet, V. 1994, Modulation Schemes for the Polarimeter of the SVST, IAC internal report

LPSP First Light

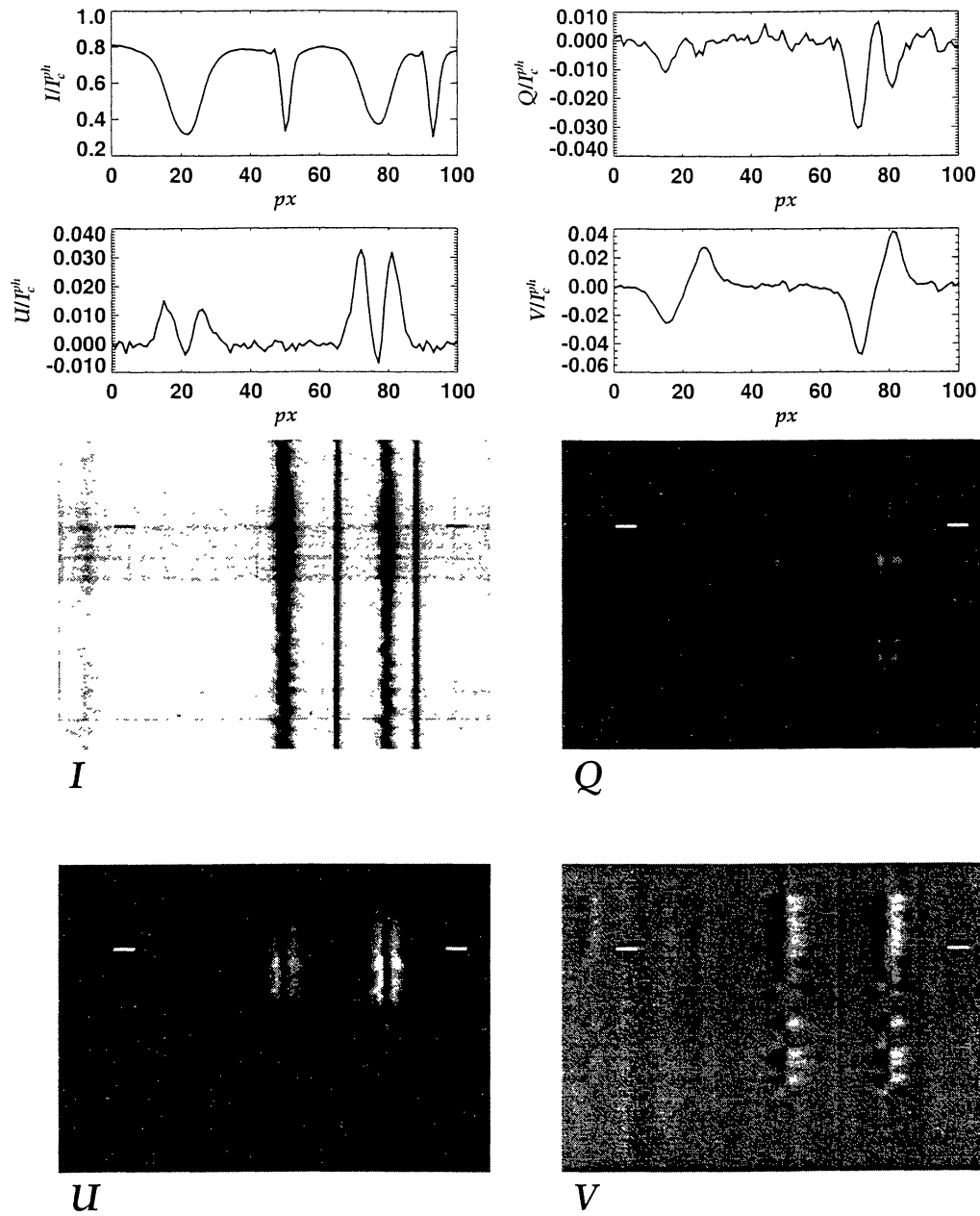


Figure 1. LPSP first light Stokes spectral images with the slit crossing the penumbra of a sunspot. The profiles in the upper part correspond to the point marked with white horizontal bars on the images. The spectral range includes the lines FeI $\lambda\lambda$ 6301 and 6302 Å. The slit length is about 60''.

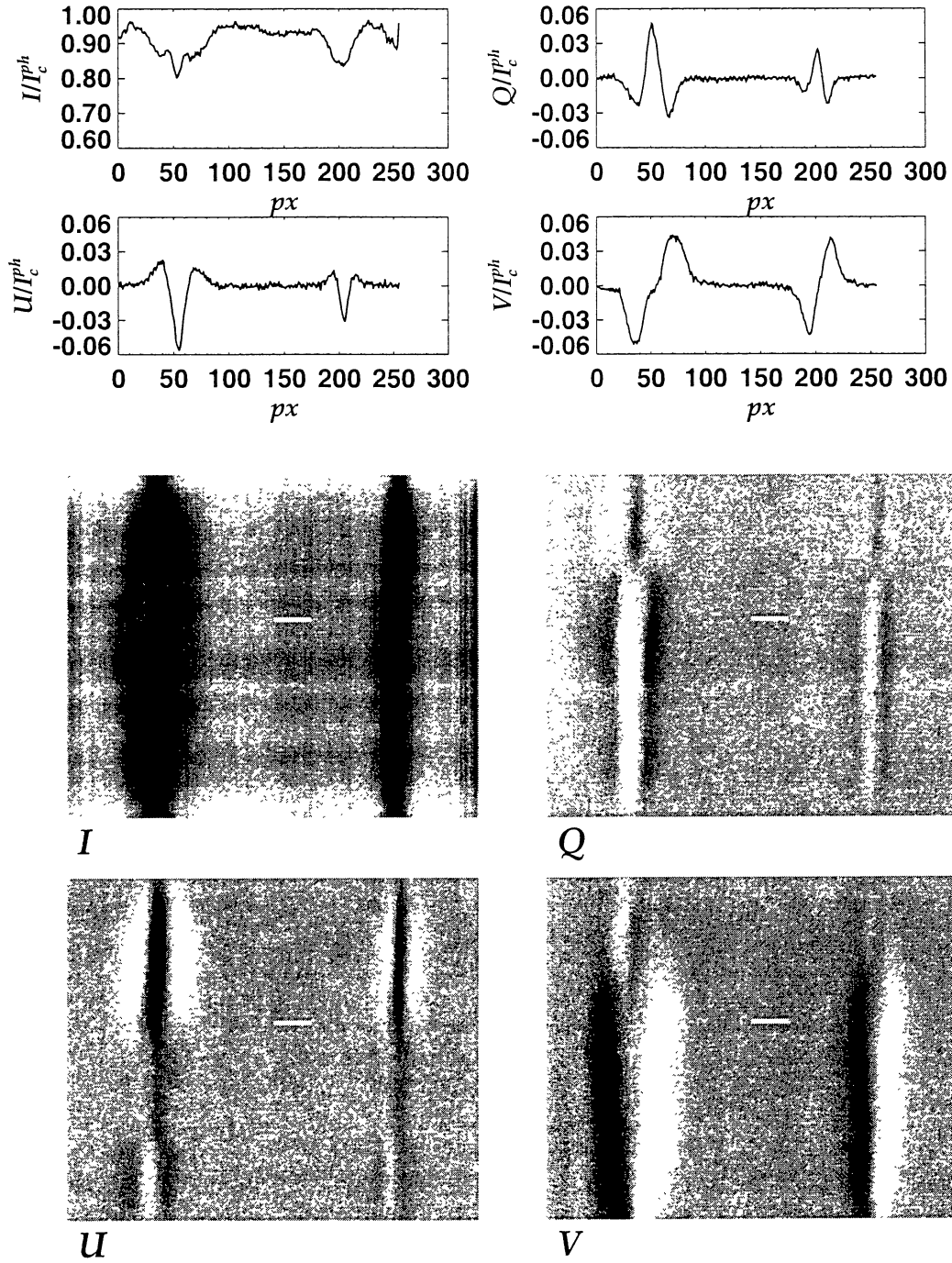


Figure 2. Stokes spectral images of a penumbral region obtained with TIP, including 2 FeI lines at $15648 \text{ \AA}$ ($g_{eff}=3$) and $15653 \text{ \AA}$ ($g_{eff}=1.6$). The spectral range is close to $8 \text{ \AA}$, the slit length is about $40''$. The profiles in the upper part correspond to the point marked with horizontal bars on the images.

Participants List

ABRAMENKO Valentina I.
Crimean Astrophysical Observatory
334413 Nauchny, Crimea
Ukraine
e-mail: avi@crao.crimea.ua

ALISSANDRAKIS Costas
University of Ioannina
Dept. of Physics - Section of AstroGeophysics
45110 Ioannina
Greece
e-mail: calissan@cc.uoi.gr

AMARI Tahar
CNRS
Saclay - DSM/DAPNIA Service d'Astrophysique
Batiment 709, l'Orme des Merisiers
91191 Gif sur Yvette Cedex
France
e-mail: amari@discovery.saclay.cea.fr

ANDREWS Michael
Raytheon ITSS/NRL
Code 7660
Washington DC 20375
USA
e-mail: andrews@louis14.nrl.navy.mil

ANTALOVA Anna
Astronomical Institute
Slovak Academy of Sciences
059 60 Tatransk Lomnica
Slovak Republic
e-mail: antalova@ta3.sk

ARREGI Inigo
Universitat de les Illes Balears
Departament de Fisica
07071 Palma de Mallorca
Spain
e-mail: arregi@hubble.uib.es

ASCHWANDEN Markus J.
Lockheed Martin Advanced Technology Center
Solar and Astrophysics Laboratory
Dept. L941, Bldg. 252, 3251 Hanover St
Palo Alto
CA 94304
USA
e-mail: aschwenden@lmsal.com

AYUKOV Sergey
Sternberg Astronomical Institute
Moscow State University
Universitetsky pr. 13
119899 Moscow
Russia
e-mail: asv@sai.msu.su

BAGALA L. Gabriela
MPI fur Extraterrestrische Physik (MPE)
Postfach 1603
85740 Garching
Germany
e-mail: gbagala@mpe.mpg.de

BALANCA Christian
Observatoire de Paris-Meudon
5 Place J. Janssen
92195 Meudon
France
e-mail: balanca@obspm.fr

BALLAI Istvan
Centre for Plasma Astrophysics - K.U. Leuven
Celestijnenlaan 200b
3001 Heverlee
Belgium
e-mail: Istvan.Ballai@wis.kuleuven.ac.be

BALLATORE Paola
LPCE/CNRS
Avenue de la Recherche Scientifique
45071 Orleans Cedex 2
France
e-mail: ballator@cnrs-orleans.fr

BALLESTER Jose Luis
Universitat de les Illes Balears
Departament de Fisica
07071 Palma de Mallorca
Spain
e-mail: dfsjlb0@ps.uib.es

BASTIAN Tim
NRAO
P.O. Box O
Socorro
NM 87801
USA
e-mail: tbastian@nrao.edu

BELIEN Alexander J.C.
FOM Institute for Plasma Physics 'Rijnhuizen'
P.O. Box 1207
Nieuwegein 3430 BE
The Netherlands
e-mail: belien@rijnh.nl

BELIK Marcel
Observatory Upice
54232 Upice
Czech Republic
e-mail: marcel_belik@geocities.com

BELVEDERE Gaetano
Osservatorio Astrofisico di Catania
Via S. Sofia, 78, Cittu Universitaria
95125 Catania
Italy
e-mail: gbeldere@alpha4.ct.astro.it

BENEVOLENSKAYA Elena
Pulkovo Astronomical Observatory
196140 St. Petersburg
Russia
e-mail: elena.benevolenskaya@pobox.spbu.ru

BENZ Arnold O.
Institute of Astronomy
ETH Zurich
8092 Zurich
Switzerland
e-mail: benz@astro.phys.ethz.ch

BERLICKI Arkadiusz
Astronomical Institute of Wroclaw University
Ul. Kopernika 11
51622 Wroclaw
Poland
e-mail: berlicki@astro.uni.wroc.pl

BERRILLI Francesco
Universit. di Roma 'Tor Vergata'
Dipartimento di Fisica
Viale della Ricerca Scientifica 1
00133 Roma
Italy
e-mail: berrilli@roma2.infn.it

BETTA Rita
University of Chicago, ASCI Flash Center
5640 South Ellis Av., RI 468
Chicago
IL 60637
USA
e-mail: betta@flash.uchicago.edu

BIANCHINI Lara
Universit. Dell'Aquila, Dipartimento di Fisica
Via Vetoio 10
67010 Coppito, L'Aquila
Italy
e-mail: lara.bianchini@aquila.infn.it

BLEYBEL Ali
Laboratoire de Physique Solaire
DASOP/Observatoire de Paris
91195 Meudon Principal Cedex
France
e-mail: bleybel@mesopa.obspm.fr

BOCCHIALINI Karine
IAS Université de Paris XI - CNRS
Bat. 121
91405 Orsay Cedex
France
e-mail: bocchialini@ias.fr

BOGOD Vladimir
Special Astrophysical Observatory
Pulkovskoe Shosse 65
196140 St. Petersburg
Russia
e-mail: vbog@radiosun.spb.su

BOTHMER Volker
ETP/University of Kiel
Extraterrestrische Physik, IEAP, Universitaet Kiel
Leibnizstr. 11
24118 Kiel
Germany
e-mail: bothmer@kernphysik.uni-kiel.de

BRIAND Carine
Telescopio THEMIS, IAC
Via Lactea,
38200 La Laguna, Tenerife
Spain
e-mail: cbriand@ll.iac.es

BUMBA Vaclav
Astronomical Institute
Academy of Science of the Czech Republic
25165 Ondrejov
Czech Republic
e-mail: bumba@asu.cas.cz

CACCIN Bruno
Università di Roma 'Tor Vergata'
Dipartimento di Fisica
V.le della Ricerca Scientifica 1
00133 Roma
Italy
e-mail: caccin@roma2.infn.it

CAMPOS L.M.B.C.
Instituto Superior Tecnico
Av. Rovisco Pais
1049-001 Libson
Portugal
e-mail: lmbcampos.aero@popsrv.ist.utl.pt

CARBONE Vincenzo
Università della Calabria
Dipartimento di Fisica
87036 Arcavacata di Rende (CS)
Italy
e-mail: carbone@fis.unical.it

CARLSSON Mats
Institute of Theoretical Astrophysics
University of Oslo
P.O. Box 1029, Blindern
0315 Oslo
Norway
e-mail: mats.carlsson@astro.uio.no

CAVALLINI Fabio
Osservatorio Astrofisico di Arcetri
Largo Enrico Fermi 5
50125 Firenze
Italy
e-mail: fabio@arcetri.astro.it

CEPPATELLI Guido
Telescopio THEMIS
IAC
Via Lactea
38200 La Laguna, Tenerife
Spain
e-mail: ceppatelli@ll.iac.es

CHIUDERI Claudio
Università di Firenze
Dipartimento di Astronomia e Scienza dello Spazio
Largo Fermi 5
50125 Firenze
Italy
e-mail: chiuderi@arcetri.astro.it

CHRISTOPOULOU Eugenia
National Observatory of Athens
Thessalias 13
Petrroupoli
13231 Athens
Greece
e-mail: a304@sapfo.astro.noa.gr

CIRIGLIANO Daniela
IAS Université de Paris XI - CNRS
Bat. 121
91405 Orsay Cedex
France
e-mail: cirigliano@medoc-ias.u-psud.fr

CLETTE Frederic
Observatoire Royal de Belgique
Avenue Circulaire 3
B-1180 Bruxelles
Belgium
e-mail: fred@oma.be

CONSOLINI Giuseppe
Ist. di Fisica dello Spazio Interplanetario/CNR
Via Fosso del Cavaliere 100
00133 Roma
Italy
e-mail: consolini@ifsi.rm.cnr.it

CORBYN Piers
Weather Action
South Bank Technopark, 90 London Rd
London SE1 6LN
United Kingdom
e-mail: weatheraction@compuserve.com

CROSBY Norma Bock
ESTEC/TOS-EMA
P.O. Box 299
2200 AG Noordwijk
The Netherlands
e-mail: ncrosby@wm.estec.esa.nl

CULHANE John Leonard
Mullard Space Science Laboratory
Holmbury St. Mary
Dorking
Surrey RH5 6NT
United Kingdom
e-mail: jlc@mssl.ucl.ac.uk

CURDT Werner
Max Planck Institut für Aeronomie
37191 Katlenburg-Lindau
Germany
e-mail: curdt@linmpi.mpg.de

CZAYKOWSKA Anja
MPI für Extraterrestrische Physik
Giessenbachstrasse
85748 Garching
Germany
e-mail: acz@mpe.mpg.de

DAMMASCH Ingolf E.
Max Planck Institut für Aeronomie
Max Planck St. 2
37191 Katlenburg-Lindau
Germany
e-mail: dammasch@linmpi.mpg.de

DARA Eleni
Research Centre for Astronomy
Academy of Athens
14 Anagnostopoulou St.
10673 Athens
Greece
e-mail: edara@atlas.uoa.gr

DE GROOF Anik
Centre of Plasma Astrophysics
K.U. Leuven
Celestijnenlaan 200b
3001 Heverlee
Belgium
e-mail: anik.degroof@wis.kuleuven.ac.be

DEL ZANNA Giulio
Centre for Astrophysics
University of Central Lancashire
Preston PR1 2HE
United Kingdom
e-mail: gdz@uclan.ac.uk

DEL ZANNA Luca
Università di Firenze
Dipartimento di Astronomia e Scienza dello Spazio
Largo Fermi 5
50125 Firenze
Italy
e-mail: ldz@arcetri.astro.it

DE MOORTEL Ineke
St. Andrews University
Dept. of Mathematics
North Haugh-St. Andrews
Fife KY16 9SS, Scotland
United Kingdom
e-mail: ineke@dcs.st-and.ac.uk

DERMENDJIEV Vladimir Nikolov
Inst. of Astronomy
Bulgarian Academy of Sciences
72 Tsarigradsko Chaussee Blvd.
1784 Sofia
Bulgaria
e-mail: vlterm@astro.bas.bg

DE STERCK Hans
Centre for Plasma Astrophysics
K.U. Leuven
Celestijnenlaan 200b
3001 Heverlee
Belgium
e-mail: hans.desterck@wis.kuleuven.ac.be

DEUBNER Franz-Ludwig
Astronomisches Institut der Univ. Würzburg
Am Hubland
97074 Würzburg
Germany
e-mail: deubner@astro.uni-wuerzburg.de

DRAGO Franca
Università di Firenze
Dipartimento di Astronomia e Scienza dello Spazio
Largo Enrico Fermi 5
50125 Firenze
Italy
e-mail: drago@arcetri.astro.it

DULK George
Observatoire de Paris-Meudon
5 Place J. Janssen
92195 Meudon
France
e-mail: dulk@obspm.fr

EFF-DARWICH Antonio
 Harvard-Smithsonian Center for Astrophysics
 60 Garden St.
 Cambridge
 MA 02138
 USA
 e-mail: adarwich@cfa.harvard.edu

EGIDI Alberto
 Università di Roma 'Tor Vergata'
 Dipartimento di Fisica
 Viale della Ricerca Scientifica 1
 00133 Roma
 Italy
 e-mail: egidi@roma2.infn.it

ERDELYI Robert
 Space & Atmospheric Research Centre
 University of Sheffield
 Hicks Bldg., Western Bank
 Sheffield S10 2TN
 United Kingdom
 e-mail: robertus@sheffield.ac.uk

FALCHI Ambretta
 Osservatorio di Arcetri
 Largo Fermi 5
 50125 Firenze
 Italy
 e-mail: falchi@arcetri.astro.it

FARNIK Frantisek
 Astronomical Institute
 25165 Ondrejov
 Czech Republic
 e-mail: ffarnik@asu.cas.cz

FLECK Bernhard
 ESA Space Science Department
 NASA/GSFC - MC 682.3
 Greenbelt
 MD 20771
 USA
 e-mail: bfleck@esa.nascom.nasa.gov

FLEISHMAN Gregory
 Ioffe Physical-Technical Institute
 Ul. Polytekhnicheskaya 26
 194021 St. Petersburg
 Russia
 e-mail: gregory@sun.ioffe.rssi.ru

FLETCHER Lyndsay
 Lockheed Martin Solar & Astrophysics Lab.
 Bldg. 252
 3251 Hanover St.
 Palo Alto
 CA 94304
 USA
 e-mail: fletcher@sag.lmsal.com

FOING Bernard
 ESA-ESTEC
 Space Science Department, Astrophysics Division
 Postbus 299
 2200 AG Noordwijk\

The Netherlands
 e-mail: bfoing@eso.estec.esa.nl

FOLEY Carl
 Mullard Space Science Laboratory
 Holmbury St. Mary
 Dorking
 Surrey RH5 6NT
 United Kingdom
 e-mail: carl.foley@mssl.ucl.ac.uk

FORSYTH Robert J.
 Imperial College, The Blackett Laboratory
 Prince Consort Rd.
 London SW7 2BZ
 United Kingdom
 e-mail: r.forsyth@ic.ac.uk

FOULLON Claire
 Solar Theory Group, University of St. Andrews
 North Haugh, St. Andrews
 Fife KY16 9SS, Scotland
 United Kingdom
 e-mail: clairef@dcs.st-and.ac.uk

FRANCIA Patrizia
 Università dell'Aquila
 Dipartimento di Fisica
 Via Vetoio 10
 67010 Coppito, L'Aquila
 Italy
 e-mail: patrizia.francia@aquila.infn.it

GARCIA Adriana
 Observatorio de Coimbra
 Almas de Freire - Sta Clara
 3040 Coimbra
 Portugal
 e-mail: astronomico@gemini.ci.uc.pt

GARCIA Howard
Space Environment Center/NOAA
325 Broadway - MS R/E/SE
Boulder
CO 80303
USA
e-mail: hgarcia@sec.noaa.gov

GAVRYUSEV Vladimir
CAISMI/CNR
Largo Fermi 5
50125 Firenze
Italy
e-mail: vladimir@arcetri.astro.it

GAVRYUSEVA Elena
Largo Fermi 5
50125 Firenze
Italy
e-mail: elena@arcetri.astro.it

GBUREK Szymon
Space Research Centre, Polish Academy of Sciences
Ul. Kopernika 11
51622 Wroclaw
Poland
e-mail: sg@cbk.pan.wroc.pl

GELFREIKH George
Pulkovo Astronomical Observatory
196140 St. Pertersburg
Russia
e-mail: gbg@GG1623.spb.edu

GELLY Bernard
CNRS/Università de Nice
UMR 6525 Astrophysique, Parc Valrose
06108 Nice
France
e-mail: gelly@unice.fr

GEORGAKILAS Alexander
National Observatory of Athens
Thessalias 13
Petroupoli
13231 Athens
Greece
e-mail: a304@sapfo.astro.noa.gr
algeorg@titan.astro.noa.gr

GIBSON Sarah
University of Cambridge
Dept. of Applied Mathematics & Theoretical Physics
Cambridge CB3 9EW
United Kingdom
e-mail: s.gibson@damtp.cam.ac.uk

GIULIANI Paolo
Università della Calabria
Dipartimento di Fisica
87036 Arcavacata di Rende (CS)
Italy
e-mail: giulianip@fis.unical.it

GIZANI Nektaria
University of Ioannina
Kalymnou 13
11251 Athens
Greece
e-mail: ngizani@cc.uoa.gr

GODIER Stefany
Avenue Nicolas Copernic
06130 Grasse
France
e-mail: godier@obs-azur.fr

GODOLI Giovanni
Università di Firenze
Dipartimento di Astronomia e Scienza dello Spazio
Largo Enrico Fermi 5
50125 Firenze
Italy
e-mail: godoli@arcetri.astro.it

GOLIGHTLY Michael
NASA Johnson Space Center, SN-3
Houston
TX 77058
USA
e-mail: mgolight@ems.jsc.nasa.gov

GONTIKAKIS Costis
Research Center for Astronomy
Academy of Athens
14 Anagnostopoulou Str.
10673 Athens
Greece
e-mail: cgontikakis@hotmail.com

GOOSSENS Marcel
 Centre for Plasma Astrophysics - K.U. Leuven
 Celestijnenlaan 200b
 3001 Heverlee
 Belgium
 e-mail: marcel.goossens@wis.kuleuven.ac.be

HOWARD Russell
 Naval Research Laboratory (NRL)
 Code 7660
 Washington DC 20375
 USA
 e-mail: russell.howard@nrl.navy.mil

HACKENBERG Peter
 An der Sternwarte 16
 14482 Potsdam
 Germany
 e-mail: phackenberg@aip.de

HUBER Martin
 ESTEC/SCI
 Postbus 299
 2200 AG Noordwijk
 The Netherlands
 e-mail: mhuber@estec.esa.nl

HANSTEEN Viggo
 Institute of Theoretical Astrophysics
 University of Oslo
 1029 Blindern, 0315 Oslo
 Norway
 e-mail: viggoh@astro.uio.no

IOSHPA Boris
 IZMIRAN
 142092 Troitsk, Moscow Region
 Russia
 e-mail: ioshpa@izmiran.troitsk.ru

HARRISON Richard
 Space Science Department
 Rutherford Appleton Laboratory
 Chilton, Didcot
 Oxfordshire OX11 0QX
 United Kingdom
 e-mail: r.harrison@rl.ac.uk

ISAAK George R.
 University of Birmingham
 School of Physics and Astronomy - Edgbaston
 Birmingham B15 2TT
 United Kingdom
 e-mail: gri@star.sr.bham.ac.uk

HEINZEL Petr
 Ondrejov Observatory
 Astronomical Institute
 25165 Ondrejov
 Czech Republic
 e-mail: pheinzel@asu.cas.cz

ISAEVA Natalia
 Instituto Superior Tecnico
 Av. Rovisco Pais
 1049-001 Libson
 Portugal
 e-mail: pcni@pop.isr.ist.utl.pt

HOFER Mirjam Y.
 ISFI/CNR
 Via del Fosso Cavaliere 100
 00133 Roma
 Italy
 e-mail: Mirjam.Hofer@ifsi.rm.cnr.it

ISSAUTIER Karine
 Observatoire de Paris-Meudon
 DESPA - Bat. 16
 5 Place J. Janssen
 92195 Meudon Principal Cedex
 France
 e-mail: issautier@obspm.fr

HORNIG Gunnar
 Theoretische Physik IV
 Ruhr-University Bochum
 44780 Bochum
 Germany
 e-mail: gh@tp4.ruhr-uni-bochum.de

JAKIMIEC Jerzy
 University of Wrocław
 Astronomical Institute
 Ul. Kopernika 11
 51622 Wrocław
 Poland
 e-mail: jjakim@astro.uni.wroc.pl

JIRICKA Karel
Ondrejov Observatory
Astronomical Institute
25165 Ondrejov
Czech Republic
e-mail: jiricka@asu.cas.cz

JOHNSON Steve
2400 NASA, Road 1, Mailstop C23
Houston
TX 77058
USA
e-mail: asjohnson@ems.jsc.nasa.gov

JORDAN Stuart
NASA Goddard Space Flight Center
Code 682
Greenbelt
MD 20771
USA
e-mail: jordan@stars.gsfc.nasa.gov

KARLICKY Marian
Astronomical Institute
25165 Ondrejov
Czech Republic
e-mail: karlicky@asu.cas.cz

KEPA Anna
Space Research Centre
Polish Academy of Sciences
Ul. Kopernika 11
51622 Wroclaw
Poland
e-mail: ak@cbk.pan.wroc.pl

KEPPENS Rony
FOM Institute Rijnhuizen
P.O. Box 1207
3430 BE Nieuwegein
The Netherlands
e-mail: keppens@rijnh.nl

KLEIN Karl-Ludwig
Observatoire de Meudon, DASOP
5 Place J. Janssen
92195 Meudon
France
e-mail: ludwig.klein@obspm.fr

KLIEM Bernhard
Astrophysical Institute Potsdam
An der Sternwarte 16
14482 Potsdam
Germany
e-mail: bkliem@aip.de

KLVANA Miroslav
Astronomical Institute
Academy of Science of the Czech Rep.
25165 Ondrejov
Czech Republic
e-mail: mklvana@asu.cas.cz

KOSOVICHEV Alexander
Stanford University
455 via Palou
Stanford
CA 94305-4085
USA
e-mail: sasha@quake.stanford.edu

KOTRC Pavel
Astronomical Institute
Academy of Science of the Czech Republic
25165 Ondrejov
Czech Republic
e-mail: pkotrc@sunkl.asu.cas.cz

KRASNOSELSKIKH Vladimir
LPCE/CNRS
3a Avenue de la Recherche Scientifique
45071 Orleans
France
e-mail: vkrasnos@cnrs-orleans.fr

KUCERA Ales
Astronomical Institute
Slovak Academy of Sciences
05960 Tatransk Lomnica
Slovak Republic
e-mail: akucera@ta3.sk

KUIJPERS Jan
Astronomical Institute Utrecht
P.O. Box 80 000
3508 TA Utrecht
The Netherlands
e-mail: kuijpers@phys.uu.nl

KUZANYAN Kirill
 IZMIRAN
 Solar-Terrestrial Department
 142092 Troitsk, Moscow Region
 Russia
 e-mail: kuzanyan@dnttm.ru

LABROSSE Nicolas
 Institut d'Astrophysique Spatiale
 Université Paris Sud, Batiment 121
 91405 Orsay Cedex
 France
 e-mail: labrosse@medoc-ias.u-psud.fr

LABS Dietrich
 Landessternwarte
 Koenigstuhl 11
 69117 Heidelberg
 Germany
 e-mail: D.Labs@lsw.uni-heidelberg.de

LANDI DEGL'INNOCENTI Egidio
 Università di Firenze
 Dipartimento di Astronomia e Scienza dello Spazio
 Largo Enrico Fermi 5
 50125 Firenze
 Italy
 e-mail: landie@arcetri.astro.it

LANDI Enrico
 Università di Firenze
 Dipartimento di Astronomia e Scienza dello Spazio
 Largo E. Fermi 5
 50125 Firenze
 Italy
 e-mail: enricol@arcetri.astro.it

LANDINI Massimo
 Università di Firenze
 Dipartimento di Astronomia e Scienza dello Spazio
 Largo E. Fermi 5
 50125 Firenze
 Italy
 e-mail: landini@arcetri.astro.it

LEBLANC Yolande
 Observatoire de Paris-Meudon
 5 Place J. Janssen
 92195 Meudon
 France
 e-mail: leblanc@obspm.fr

LEPIDI Stefania
 Istituto Nazionale di Geofisica
 Via Vetoio 10
 67010 Coppito, L'Aquila
 Italy
 e-mail: stefania.lepidi@aquila.infn.it

LEPRETI Fabio
 Dipartimento di Fisica
 e Ist. Nazionale per la Fisica della Materia
 87036 Arcavacata di Rende (CS)
 Italy
 e-mail: carbone2@fis.unical.it

LI Wei
 Beijing Astronomical Observatory
 Huairou Group - Datun
 Rd. 20a - Chaoyang District
 100012 Beijing
 P.R. China
 e-mail: lw@sun10.bao.ac.cn

LINTON Mark
 US Naval Research Laboratory
 Code 7675
 Washington DC 20375
 USA
 e-mail: linton@zeus.nrl.navy.mil

LIONELLO Roberto
 SAIC
 10260 Campus Point Dr. - MS E3X
 San Diego
 CA 92121-1578
 USA
 e-mail: lionel@iris023.saic.com

LOWE Robert
 Queen Mary and Westfield College
 Mile End Road
 London E1 4NS
 United Kingdom
 e-mail: R.Lowe@qmw.ac.uk

LUDMANY Andras
 Debrecen Observatory
 P.O. Box 30
 4010 Debrecen
 Hungary
 e-mail: ludmany@tigris.klte.hu

LYONS Mark
University of Birmingham
School of Physics and Astronomy - Edgbaston
Birmingham B15 2TT
United Kingdom
e-mail: mal@star.sr.bham.ac.uk

MACCARI Lisa
Università di Firenze
Dipartimento di Astronomia e Scienza dello Spazio
Largo E. Fermi 5
50125 Firenze
Italy
e-mail: lisa@arcetri.astro.it

MACKAY Duncan H.
St. Andrews University
Dept. of Mathematics
North Haugh, St. Andrews
Fife KY16 9SS, Scotland
United Kingdom
e-mail: duncan@dcs.st-and.ac.uk

MacNEICE Peter
NASA Goddard Space Flight Center, Code 931
Greenbelt
MD 20770
USA
e-mail: macneice@alfven.gsfc.nasa.gov

MAKAROV Valentine I.
Pulkovo Astronomical Observatory
Pulkovskoe St. 65/1
196140 St. Pertersburg
Russia
e-mail: makarov@gaosun.spb.su

MALARA Francesco
Dipartimento di Fisica
Università della Calabria
87036 Arcavacata di Rende (CS)
Italy
e-mail: malara@fermi.fis.unical.it

MANCUSO Salvatore
Univ. of Iowa, Dept. of Physics and Astronomy
203 Van Allen Hall
Iowa City
IA 52242
USA
e-mail: smancuso@newton.physics.uiowa.edu

MANDRINI Cristina
I.A.F.E.
CC. 67, Suc. 28
1428 Buenos Aires
Argentina
e-mail: mandrini@iafe.uba.ar

MARKOVA Eva
Upice Observatory
54232 Upice
Czech Republic
e-mail: markovae@mbox.vol.cz

MARKOVSKII Sergei
Sternberg Astronomical Institute
Moscow State University
Universitetsky pr.13
119899 Moscow
Russia
e-mail: mark@sai.msu.su

MARSCH Eckart
Max Planck Institut für Aeronomie
Max Planck St. 2
37191 Katlenburg-Lindau
Germany
e-mail: marsch@linmpi.mpg.de

MAUAS Pablo
Instituto de Astronomia y Fisica del Espacio
Ciudad Universitaria, Pabellon IAFE
Buenos Aires
Argentina
e-mail: pablo@iafe.uba.ar

McKENZIE James F.
Max Planck Institut für Aeronomie
37191 Katlenburg-Lindau
Germany
e-mail: mckenzie@linmpi.mpg.de

MELNIKOV Victor F.
Radiophysical Research Institute (NIRFI)
Pecherskaya St. 25
603600 Nizhnii Novgorod
Russia
e-mail: meln@nirfi.sci-nnov.ru
VMelnikov@solar.stanford.edu

MESSEROTTI Mauro
Osservatorio Astronomico di Trieste
Via G.B. Tiepolo 11
34131 Trieste
Italy
e-mail: messerotti@ts.astro.it

MESZAROSOVA Hana
Astronomical Institute
25165 Ondrejov
Czech Republic
e-mail: hmeszaro@asu.cas.cz

MEYER-VERNET Nicole
Dt Recherche Spatiale - Observatoire de Paris
DESPA - Bat. 16
92195 Meudon Cedex
France
e-mail: nicole.meyer@obspm.fr

MICHALEK Grzegorz
Astronomical Observatory
Jagellonian University
Ul. Orla 171
30244 Krakow
Poland
e-mail: michalek@oa.uj.edu.pl

MIRALLES Mari Paz
Harvard-Smithsonian Center for Astrophysics
60 Garden St. - MS 50
Cambridge
MA 02138
USA
e-mail: mmiralles@cfa.harvard.edu

MULLAN Dermott
Bartol Research Institute
University of Delaware
Newark
DE 19716
USA
e-mail: mullan@bartol.udel.edu

NAKAGAWA Akinari
Università di Firenze
Largo Fermi 5
50125 Firenze
Italy
e-mail: nakagawa@arcetri.astro.it

NAKARIAKOV Valery
St. Andrews University, Dept. of Mathematics
North Haugh - St. Andrews
Fife KY16 9SS, Scotland
United Kingdom
e-mail: valery@dcs.st-andrews.ac.uk

NARAYANAN Satya
Indian Institute of Astrophysics
Koramangala II Block, Sarjapur Road
560034 Bangalore
India
e-mail: satya@iiap.ernet.in

NEUKIRCH Thomas
St. Andrews University, Dept. of Mathematics
North Haugh - St. Andrews
Fife KY16 9SS, Scotland
United Kingdom
e-mail: thomas@mcs.st-and.ac.uk

NOCERA Luigi
Istituto di Fisica Atomica e Molecolare-CNR
Via Giardini 7
56127 Pisa
Italy
e-mail: nocera@ifam.pi.cnr.it

NOCI Giancarlo
Università di Firenze
Dipartimento di Astronomia e Scienza dello Spazio
Largo Enrico Fermi 5
50125 Firenze
Italy
e-mail: noci@arcetri.astro.it

ODSTRCIL Dusan
Astronomical Institute
25165 Ondrejov
Czech Republic
e-mail: odstrcil@asu.cas.cz

OLIVER Ramon
Universitat de les Illes Balears
Departament de Fisica
07071 Palma de Mallorca
Spain
e-mail: dfsroh4@ps.uib.es

O'SHEA Eoghan
The Queens University of Belfast
Department of Pure and Applied Physics
Belfast BT7 1NN
Northern Ireland
United Kingdom
e-mail: E.Oshea@Queens-Belfast.ac.uk

PALLE Pere L.
Instituto de Astrofisica de Canarias
Calle Via Lactea s/n
38205 La Laguna, Tenerife
Spain
e-mail: plp@ll.iac.es

PARENTI Susanna
University of Central Lancashire
Corporation St.
Preston PR1 2HE
United Kingdom
e-mail: s_p@uclan.ac.uk

PATERNO Lucio
Università di Catania, Dipartimento di Fisica
Viale A. Doria 6
95125 Catania
Italy
e-mail: lpaterno@alpha4.ct.astro.it

PERES Giovanni
Osservatorio Astronomico di Palermo
P.za del Parlamento 1
90134 Palermo
Italy
e-mail: peres@oapa.astropa.unipa.it

PEREZ Maria Elena
Armagh Observatory
College Hill
Armagh BT61 9DG
Northern Ireland, United Kingdom
e-mail: epp@star.arm.ac.uk

PETRIE Gordon
Mathematical Institute
University of St. Andrews
North Haugh, St. Andrews
Fife KY16 9SS
United Kingdom
e-mail: gordonp@mcs.st-and.ac.uk

PICK Monique
Observatoire de Paris
Section Meudon - DASOP
92195 Meudon Principal Cedex
France
e-mail: pick@obspm.fr

PIETROPAOLO Ermanno
Dipartimento di Fisica, Università dell'Aquila
Via Vetoio 10
67010 Coppito, L'Aquila
Italy
e-mail: ermanno@univaq.it

PODLADCHIKOVA Olena
LPCE/CNRS/Université d'Orleans
3A Av. de la Recherche Scientifique
45071 Orleans Cedex 2
France
e-mail: epodlad@cnrs-orleans.fr

POEDTS Stefaan
Centre for Plasma Astrophysics - K.U. Leuven
Celestijnenlaan 200b
3001 Heverlee
Belgium
e-mail: Stefaan.Poedts@wis.kuleuven.ac.be

POHJOLAINEN Silja
Observatoire de Paris, Section Meudon -DASOP
5 Pl. Janssen
92195 Meudon Principal Cedex
France
e-mail: pohjola@mesopy.obspm.fr
Silja.Pohjolainen@hut.fi

POLETTI Giannina
Osservatorio di Arcetri
Largo Enrico Fermi 5
50125 Firenze
Italy
e-mail: poletto@arcetri.astro.it

POMMOIS Pierre
Università della Calabria
Dipartimento di Fisica
87036 Arcavacata di Rende (CS)
Italy
e-mail: pommois@fis.unical.it

PRIEST Eric

St. Andrews University- Dept. of Mathematics
 North Haugh, St. Andrews
 Fife KY16 9SS, Scotland
 United Kingdom
 e-mail: eric@dcs.st-and.ac.uk

RODRIGUEZ HIDALGO Ines

Instituto de Astrofísica de Canarias
 Calle Via Lactea s/n
 38200 La Laguna
 Spain
 e-mail: irh@iac.es

PRIMAVERA Leonardo

Università della Calabria
 Dipartimento di Fisica
 87036 Arcavacata di Rende (CS)
 Italy
 e-mail: lprim@plashp3.fis.unical.it

ROGAVA Andria

Abastumani Astrophysical Obs., Georgia
 CPA - Celestijnenlaan 200b
 3001 Heverlee
 Belgium
 e-mail: Andria.Rogava@wis.kuleuven.ac.be

RANK Gerhard

MPI für Extraterrestrische Physik
 Giessenbachstrasse
 85740 Garching
 Germany
 e-mail: gZR@mpe.mpg.de

ROMEOU Zacharenia

School of Math. & Computational Sciences
 University of St. Andrews
 St. Andrews
 Fife KY16 9UY, Scotland
 United Kingdom
 e-mail: zrom@dcs.st-and.ac.uk

RAOUAFI Nour-Eddine

Institut d'Astrophysique Spatiale
 Univ. Paris XI, Batiment 121
 91405 Orsay
 France
 e-mail: raouafi@medoc-ias.u-psud.fr

ROMOLI Marco

Università di Firenze
 Dipartimento di Astronomia e Scienza dello Spazio
 Largo Enrico Fermi 5
 50125 Firenze
 Italy
 e-mail: romoli@arcetri.astro.it

REARDON Kevine

Osservatorio Astronomico di Napoli
 Via Moiariello 16,
 80131 Napoli
 Italy
 e-mail: kreardon@na.astro.it

ROMPOLT Bogdan

Astronomical Institute of Wroclaw University
 ul. Kopernika 11
 51-622 Wroclaw
 Poland
 e-mail: rompolt@astro.uni.wroc.pl

REGNIER Stephane

Institut d'Astrophysique Spatiale
 Université Paris XI, Batiment 121
 91405 Orsay
 France
 e-mail: regnier@medoc-ias.u-psud.fr

ROUSSEV Ilia

Armagh Observatory, College Hill
 Armagh BT61 9DG
 Northern Ireland
 United Kingdom
 e-mail: ilr@star.arm.ac.uk

ROCA CORTES Teodoro

Instituto de Astrofísica de Canarias
 Calle Via Lactea s/n
 38205 La Laguna, Tenerife
 Spain
 e-mail: trc@astro.iac.es

RUDAWY Pawel

Astronomical Institute of Wroclaw University
 ul. Kopernika 11
 51-662 Wroclaw
 Poland
 e-mail: rudawy@astro.uni.wroc.pl

RUTTEN Robert J.
Sterrekundig Instituut
Postbus 80 000
35098-TA Utrecht
The Netherlands
e-mail: R.J.Rutten@astro.uu.nl

SAHAL-BRECHOT Sylvie
Observatoire de Paris, DAMAP
5 Place J. Janssen
92195 Meudon Cedex
France
e-mail: Sylvie.Sahal-Brechot@obspm.fr

SCHMIDT Joachim
Space and Atmospheric Physics
The Blackett Laboratory, Imperial College
London SW7 2BZ
United Kingdom
e-mail: j.m.schmidt@ic.ac.uk

SCHMIEDER Brigitte
Observatoire de Paris
Section Meudon - DASOP
92195 Meudon Principal Cedex
France
e-mail: schmieder@obspm.fr

SCHNACK Dalton
Science Applications International Corporation
10260 Campus Point Drive
San Diego
CA 92024
USA
e-mail: schnack@iris023.saic.com

SETTELE Axel
Astrophysical Institute Potsdam
Telegrafenberg A27
14473 Potsdam
Germany
e-mail: asettele@aip.de

SEVERINO Giuseppe
Osservatorio Astronomico di Capodimonte
Via Moiariello 16
80131 Napoli
Italy
e-mail: severino@na.astro.it

SHCHUKINA Nataliya
Main Astronomical Observatory
National Academy of Sciences
252650 Kiev-22
Ukraine
e-mail: shchukin@mao.kiev.ua

SHEINER Olga
Radiophysical Research Institute (NIRFI)
Pecherskaya St. 25
603600 Nizhnii Novgorod
Russia
e-mail: rfj@nirfi.sci-nnov.ru

SIARKOWSKI Marek
Space Research Centre
Polish Academy of Sciences
ul. Kopernika 11
51622 Wroclaw
Poland
e-mail: msiark@ii.uni.wroc.pl

SIMNETT George
University of Birmingham
Birmingham B15 2TT
United Kingdom
e-mail: gms@star.sr.bham.ac.uk

SOLOMON Jacques
IAS/CNRS/Université de Paris XI
Batiment 121
91405 Orsay
France
e-mail: jacques.solomon@ias.fr

SOMOV Boris V.
Moscow State University
Universitetskii pr. 13
119899 Moscow B-234
Russia
e-mail: somov@sai.msu.su

SPADARO Daniele
Osservatorio Astrofisico di Catania
Via S. Sofia
Citt. Universitaria
95125 Catania
Italy
e-mail: dspadaro@astrct.ct.astro.it

STAUDE Jürgen
Astrophys. Inst. Potsdam/Solar Obs. 'Einsteinurm'
Telegrafenberg
14473 Potsdam
Germany
e-mail: jstaude@aip.de

TAROYAN Yeghiazar
Institute of Mathematics
National Academy of Sciences of Armenia
375019 Yerevan
Republic of Armenia
e-mail: gro@instmath.sci.am

STAWICKI Olaf
Universitaetsstr. 150
44801 Bochum
Germany
e-mail: os@tp4.ruhr-uni-bochum.de

TERIACA Luca
Armagh Observatory
College Hill
Armagh BT61 9DG
Northern Ireland, United Kingdom
e-mail: lte@star.arm.ac.uk

STENBORG Guillermo
Max Planck Institut für Aeronomie
Max Planck St. 2
37191 Katlenburg-Lindau
Germany
e-mail: stenberg@linmpi.mpg.de

TERRADAS Jaume
Universitat de les Illes Balears
07071 Palma de Mallorca
Spain
e-mail: jaume@hubble.uib.es

STRAUS Thomas
Osservatorio Astronomico di Capodimonte
Via Moiriello 16
80131 Napoli
Italy
e-mail: straus@na.astro.it

TEVZADZE Alexander G.
Centre for Plasma Astrophysics - K.U. Leuven
Celestijnenlaan 200b
3001 Heverlee
Belgium
e-mail: Alexander.Tevzadze@wis.kuleuven.ac.be

SUESS Steven T.
NASA Marshall Space Flight Center, MS ES82
Huntsville
AL 35812
USA
e-mail: steve.suess@msfc.nasa.gov

TITOV Viatcheslav
Theoretische Physik IV - NB 7/30
Ruhr-University of Bochum
44780 Bochum
Germany
e-mail: st@tp4.ruhr-uni-bochum.de

SYLWESTER Barbara
Space Research Centre
Polish Academy of Sciences
Ul. Kopernika 11
51622 Wrocław
Poland
e-mail: bs@cbk.pan.wroc.pl

TOTH Gabor
Eotvos University
Department of Atomic Physics
Pazmany Peter Setany 1/a
1117 Budapest
Hungary
e-mail: gtoth@hermes.elte.hu

SYLWESTER Janusz
Space Research Centre
Polish Academy of Sciences
Ul. Kopernika 11
51622 Wrocław
Poland
e-mail: js@cbk.pan.wroc.pl

TROTTET Gerard
Observatoire de Paris-Meudon - DASOP
5 Place J. Janssen
92190 Meudon
France
e-mail: trottet@obspm.fr

TSAP Yuri

Crimean Astrophysical Observatory
334413 Nauchny
Crimea
Ukraine
e-mail: yur@crao.crimea.ua

TSIROPOULA Georgia

National Observatory of Athens
Institute of Space Research
Lofos Koufos
15236 P. Penteli
Greece
e-mail: georgia@creator.space.noa.gr

VANDAS Marek

Astronomical Institute
Bocni II 1401
14131 Praha 4
Czech Republic
e-mail: vandas@ig.cas.cz

Van DRIEL Lidia

Observatoire de Paris
5 Place J. Janssen
92195 Meudon Cedex
France
e-mail: lvandrie@mesioq.obspm.fr

VAN LOMMEL Petra

Centre of Plasma Astrophysics - K.U. Leuven
Celestijnenlaan 200b
3001 Heverlee
Belgium
e-mail: Petra.Vanlommel@kc.kuleuven.ac.be

VARGA Emese

Lorand Eotvos University
Department of Astronomy
Pazmany Peter S. 1/a
1117 Budapest
Hungary
e-mail: vemese@ninel.elte.hu

VENNERSTROEM Susanne

Danish Space Research Institute
Juliane Maries Vej 30
2100 Copenhagen
Denmark
e-mail: sv@dsri.dk

VENTURA Rita

Osservatorio Astrofisico di Catania
V.le A. Doria 6- Citt. Universitaria
95125 Catania
Italy
e-mail: rventura@alpha4.ct.astro.it

VESELOVSKY Igor

Moscow State University
Institute of Nuclear Physics
119899 Moscow
Russia
e-mail: veselov@dec1.npi.msu.su

VIAL Jean-Claude

IAS Université de Paris XI
Bat. 121, Campus Universitaire
91405 Orsay Cedex
France
e-mail: vial@ias.fr

VILMER Nicole

Observatoire de Paris DASOP-LPSH
5 Place J. Janssen
92195 Meudon
France
e-mail: vilmer@obspm.fr

VOGT Etienne

Osservatorio Astronomico di Capodimonte
Via Moiariello 16
80131 Napoli
Italy
e-mail: vogt@na.astro.it

VOURLIDAS Angelos

GMU/Naval Research Laboratory
Code 7660
Washington DC 20375-5320
USA
e-mail: avourlid@pythia.nrl.navy.mil

VOYTENKO Yuriy M.

Centre for Plasma Astrophysics - K.U. Leuven
Celestijnenlaan 200b
3001 Heverlee
Belgium
e-mail: Yuriy.Voitenko@wis.kuleuven.ac.be

WIEHR Eberhard
Universitaets-Sternwarte Goettingen
Geismarlandstr. 11
37083 Goettingen
Germany
e-mail: ewiehr@uni-sw.gwdg.de

WILHELM Klaus
Max Planck Institut für Aeronomie
37191 Katlenburg-Lindau
Germany
e-mail: wilhelm@linmpi.mpg.de

WILSON Andrew
ESA Publications Division/DG-CP
ESTEC
PO Box 299
2200 AG Noordwijk
The Netherlands
e-mail: awilson@estec.esa.nl

WOODS Leslie
Mathematical Institute
24-29 St. Giles
Oxford OX1 3LB
United Kingdom
e-mail: leslie.woods@balliol.ox.ac.uk

ZANGRILLI Luca
CNAA
Largo Enrico Fermi 5
50125 Firenze
Italy
e-mail: lz@arcetri.astro.it

ZAQARASHVILI Teimuraz
Abastumani Astrophysical Observatory
Kazbegi Av. 2a
380060 Tbilisi
Georgia
e-mail: tm@dtapha.kheta.ge

ZHUGZHDA Yuzef
IZMIRAN
Centre for Plasma Astrophysics
Celestijnenlaan 200b
3001 Heverlee
Belgium
e-mail: Yuzef.Zhugzhda@wis.kuleuven.ac.be

ZIEGER Bertalan
Danish Space Research Institute
Juliane Maries Vej 30
2100 Copenhagen
Denmark
e-mail: zieger@dsri.dk

ZLOBEC Paolo
Osservatorio Astronomico di Trieste
Via G.B. Tiepolo 11
34131 Trieste
Italy
e-mail: zlobec@oat.ts.astro.it

ZLOTNIK Elena Yakovlevna
Institute of Applied Physics RAS
46 Uljanov St.
603600 N. Novgorod
Russia
e-mail: zlot@appl.sci-nnov.ru

Late Papers