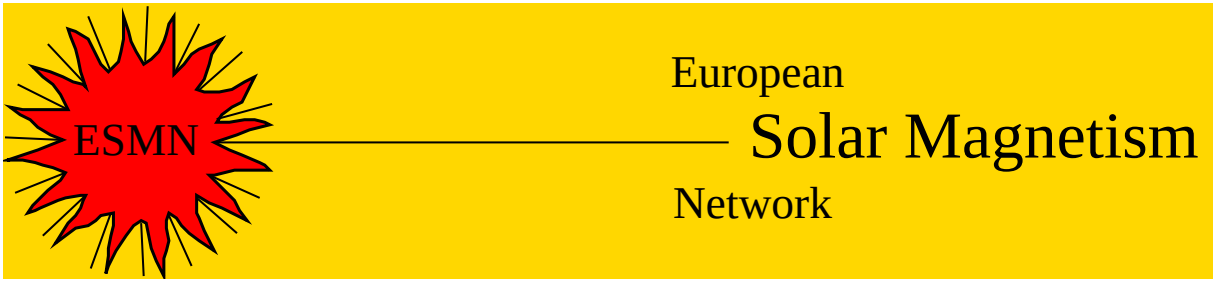

FINAL REPORT

including the

Fourth Periodic Progress Report

Network title: EUROPEAN SOLAR MAGNETISM NETWORK

Network short title: ESMN

Contract number: HPRN-CT-2002-00313

Commencement date of contract: November 1, 2002

Contract duration: 48 months

Period covered by this report: November 1, 2002 – October 31, 2006

Network coordinator: Robert J. Rutten

Organisation: Universiteit Utrecht

Address: Sterrekundig Instituut, Postbus 80 000, NL-3508 TA, Utrecht, The Netherlands

Telephone: +31-30-2535226/5200

Fax: +31-30-2535201

Email: R.J.Rutten@astro.uu.nl

Summary

The *European Solar Magnetism Network* became a well-established entity in European solar physics already during its preceding incarnation as the *European Solar Magnetometry Network* (henceforth ESMN-1). This report summarises its achievements during the second four years of its existence (ESMN-2, henceforth ESMN). In addition, it furnishes detailed information on the final ESMN year in similar manner as in the previous yearly progress reports[1].

From the autumn of 2002 until the autumn of 2006 the eleven partners making up the ESMN devoted 1965 personmonths of effort on its science objectives:

(a) structure and dynamics of solar surface fields;
(b) topology and evolution of solar active regions;
(c) magnetic coupling between the solar interior, photosphere, and outer atmosphere,

and the corresponding implementation objectives:

(d) perfection of magnetometry instrumentation and methodology;
(e) solar magnetometry through multi-telescope observing campaigns;
(f) interpretation through numerical inversions and simulations.

All tasks have been successfully addressed; various breakthroughs are highlighted below. The science product consists of over 230 professional research articles in refereed journals and conference proceedings (complete list on pp. 39 ff) while public outreach was accomplished in a host of activities. Of course, most of this effort was not funded by the EC; the principal contractual ESMN endeavour was to train EC-funded young visiting researchers. The ESMN significantly exceeded its pertinent contract deliverable of 240 such personmonths by training 12 ESMN Fellows distributed over the 8 Western partners in pre- and postdoctoral research to a total of 281 personmonths (table on page 35). The other major contractual ESMN endeavour was to perform networking across Europe. The 59 ESMN-coordinated collaborative observing campaigns, many more than originally foreseen, were the prime exponent of this activity.

Part A – Research results

A.1 Scientific Highlights

ESMN Year 4

Fellow hiring: the final ESMN year followed on what was designated as "ESMN peak year" in the previous periodic report in the expectation that the ESMN would ramp down having lost most of its Fellows already. Indeed, a significant difference between the ESMN-1 and ESMN-2 networks has been that the former could offer three-year contracts to its Fellows whereas the present ESMN was limited to 2.5-year contracts already in the proposal stage by the imposed funding constraints, and also filled its places rather fast so that many Fellows left the Network

[1] The ESMN reports are and will remain available on the ESMN website http://esmn.astro.uu.nl.

already before its fourth year. However, towards the end of the latter, on account of the overall budget situation becoming clear in detail, some additional Fellow hirings (at partners UU, AIP, and OP[2]) became possible, in part compensating for the early leave of the ESA Fellow (see below). Thus, the ESMN closure date of October 31, 2006 implied also the contract termination for five ESMN Fellows, four more than was anticipated last year, and the total of ESMN-trained Fellows rose to twelve young researchers, two more than anticipated.

ESMN highlight: an additional Year-3 anticipation was that while the ESMN would continue full-steam in organising multi-partner collaborative observing campaigns and writing papers on ESMN research, there would be no communal Network-wide activity such as an ESMN school – the third ESMN School had been forwarded from the fourth year to the beginning of the third ESMN year precisely because there wouldn't be many Fellows to train otherwise. There was no proposed plan, and therefore also no funding allocation, for a large ESMN wrap-up meeting. However, this changed at the instigation of the AIP Scientist-in-Charge, who noted that a general solar physics conference during October in Coimbra (Portugal) organised by AsU director P. Heinzel would suit well as ESMN Farewell Conference since its topic, "The Physics of Chromospheric Plasmas", covered the ESMN terrain perfectly and indeed many ESMN-ers would participate. Since the budget also permitted participation in the costs of conference organisation and proceedings editing, the ESMN became co-organiser of this conference and so it indeed became the ESMN conclusion conference, a very successful one and the highlight of the final ESMN year. Two Fellows were invited to be keynote speaker, six Scientists-in-Charge reviewed the work of their groups, many other ESMN Fellows and researchers presented their own results, and the OP Scientist-in-Charge gave a well-attended evening lecture on space weather to the general public. A special session was devoted to the ESMN completion including an appropriate conclusion ceremony. As part of this co-organisation the ESMN Coordinator became co-editor of the proceedings which will appear in the *Astronomical Society of the Pacific Conference Series*[3]. Eighteen ESMN-accountable contributions to these proceedings (*i.e.*, Fellow papers, collaborative papers, and Associated-State papers) are included as "in press" items in the Year-4 (pp. 9 ff) and Complete ESMN (pp. 39 ff) reference lists below.

Instrumentation highlight: within ESMN context the continuous improvements of the existing telescopes, of their postfocus instrumentation, and of the computer methods for data restoration, inversion, and analysis together represent important advance on the observational side of our research. The SST[4] was equipped with new high-speed cameras. IBIS matured into full user

[2]As in the earlier ESMN reports we use standard partner abbreviations for brevity throughout this report: UU = Utrecht University, IAC = Instituto de Astrofísica de Canarias (La Laguna), OAA = Istituto Nazionale di Astrofisica (Florence), UiO = Universitet i Oslo, KVA = Kungliga Vetenskapsakademien (Stockholm), AIP = Astrophysikalisches Institut Potsdam, OP = Observatoire de Paris (Meudon), ESA = European Space Agency (Noordwijk), AsU = Astronomický ústav Akademie věd České republiky (Ondřejov), AISAS = Astronomický ústav Slovenskej akadémie vied (Tatranská Lomnica), ELTE = Eötvös Loránd Tudományegyetem (Budapest).

[3]Coimbra is not located near the Pacific ocean, but this society has become a major astronomy conference publisher worldwide. And in fact, Coimbra is famous for its ancient university which was founded to improve the art of navigation for Portuguese seafarers – on their way to the Pacific. The conference was also initiated for historical reasons: Coimbra's Prof. Francisco Costa Lobo initiated spectroheliography of the solar chromosphere there eighty years ago which continues until today.

[4]Solar telescope abbreviations used in all ESMN documents, with URL and location: SST: Swedish 1-m Solar Telescope http://www.solarphysics.kva.se/, La Palma; DOT: Dutch Open telescope, http://dot.astro.uu.nl, La Palma; THEMIS: French-Italian solar telescope, http://www.themis.iac.es, Tenerife; VTT: German Vacuum Tower

availability. The GREGOR project suffers unfortunate delays in its development of innovative mirror technology but is otherwise on track. Worldwide, the top instrumentation highlight was the recent successful launch of the Japanese Solar-B mission (now called "Hinode" = sunrise and sunset). It gives high hopes of a quantum jump in our field since Hinode can register without interruptions what our groundbased ESMN telescopes only observe in the best seeing conditions, *i.e.,* no longer than a few hours at the most. The main telescope onboard Hinode operates also at optical wavelengths; at 50-cm diameter it equals UU's DOT in angular resolution but not the KVA's 1-meter SST. ESMN-like observing campaigns will from now on turn to Hinode, but likely combine Hinode observing with Canary-Island observing to obtain complementary diagnostics. Note that UiO runs Hinode's European Data Center; also other ESMN partners have close connections to the Japan–USA–UK Hinode consortium.

Observational highlight: new high-resolution Balmer Hα movies made from data taken last autumn by the UiO group with the KVA's SST at exceedingly fast cadence, as fast as three images per second thanks to the new SST cameras, were computer-restored with the new UiO-KVA MOMFBD method and demonstrate the existence of astounding dynamism in the solar chromosphere, in particular in the (not so quiet!) quietest regions. This year a successful UiO-UU SST campaign targeted Hα spectrometry at the SST with simultaneous DOT Hα imaging.

Magnetometry highlight: the IAC installed TIP-2, a major update of its Tenerife Infrared Polarimeter, at the VTT. It brings a factor two improvement in spatial resolution, in the size of the field of view, and in spectral range all at the same time. It came into full community-wide use as "Common-User Instrument" during the report year and proved to be a highly successful instrument for magnetometry in the infrared. At longer wavelengths the spectral-line signature of magnetism gains over other line broadening mechanisms because Zeeman splitting increases with the square of the wavelength whereas the Dopplerwidth does so linearly. This makes infrared magnetometry of great importance in the ESMN research area. The KVA collaborated intensively with the IAC, UiO and UU to develop SST magnetometry which is bound to become a solar-physics highlight the coming year.

Interpretational highlight: in a collaboration between UU and UiO the surprising conclusion was reached that the hydrogen Balmer Hα line, well-known as the principal diagnostic of the solar chromosphere, also provides the best diagnostic in the whole optical spectrum to locate and track small magnetic elements in photospheric intergranular lanes through proxy-magnetometry. The blue wing of the line turns out to sample the deep photosphere with greatly enhanced sensitivity to such structures compared to other spectral features, including the famous Fraunhofer-named G band which so far was the workhorse for charting small magnetic elements. Ongoing work at OAA, UiO and UU now concentrates on explaining and exploiting the excellent response of the Ca II infrared triplet lines to chromospheric fine structure.

Theoretical highlight: the identification of "dynamic fibrils" through advanced numerical simulations by the UiO team that reproduce the dynamic-fibril phenomenon discovered in last autumn's SST observations in detail, working together with colleagues at KVA and the Lockheed-

Telescope, http://www.kis.uni-freiburg.de/kiswwwe.html, Tenerife; GREGOR: German 1.5-m telescope project, http://gregor.kis.uni-freiburg.de, Tenerife; SOHO: ESA–NASA mission, http://sohowww.nascom.nasa.gov, L1 orbit; TRACE: NASA mission, http://trace.lmsal.com, Earth orbit, Solar-B/Hinode: JAXA mission, http://hinode.nao.ac.jp/index_e.shtml, Earth orbit; SDO: future NASA mission, http://sdo.gsfc.nasa.gov, geostationary orbit.

Martin company. The dynamic mass-loading and modulation of these fibrils turns out to represent magnetically-guided shocks originating from the global solar five-minute oscillation. This breakthrough is likely to evolve into full understanding of the decennia-old enigma posed by solar limb spicules.

Organisational highlight: a very important development was the ESMN-inspired foundation on June 14, 2006 of a Europe-wide solar-physics Consortium with the commitment (quote):

. . . . . to form a non-profit, legally established organisation, "European Association for Solar telescopes", EAST, at the European level. The goal of EAST shall be ensuring access of European solar astronomers to world-class observing facilities. In order to achieve this goal, EAST shall

- *develop, construct and operate a next-generation large aperture European Solar Telescope (EST) in the Canaries,*
- *coordinate the operation and scientific use of optical solar facilities in Europe,*
- *coordinate and facilitate efforts of its members to participate in other solar facilities such as the Advanced Technology Solar Telescope,*
- *facilitate access to these solar facilities also for European solar physicists who are not EAST members, and encourage their participation in EAST.*

which was signed by 5 ESMN Scientists-in-Charge and 7 other national representatives. It followed on the OAA-organised ESF (European Science Foundation) workshop on "New Large-Aperture Solar Telescopes" (Monteporzio Catone, April 9–12 2006) attended by many ESMN scientists.

Personal highlight: Andrés Asensio Ramos (ESMN Fellow at OAA, presently postdoc at IAC) received the prize of the Spanish Society of Astrophysics for the best PhD thesis during 2004–2005. The IAC Scientist-in-Charge was his thesis adviser.

With respect to the full ESMN duration

Introduction: the previous three periodic ESMN reports and the Year-4 summary above listed many ESMN highlights and advances not to be repeated here. In this section we first adopt a wider point of view to describe the state and prospects of the ESMN research area. We then pick out some research by ESMN Fellows targeting different aspects of the ESMN research area. We choose to refrain from compiling a more comprehensive Network-wide feat list representing the 1965-personmonth total effort of ESMN research because such a list would unjustifiedly suggest that the network funding from the EC generated all ESMN science – that would put too many false feathers in the EC cap. Of course, the EC's intention of young-researcher funding through its Marie Curie network programme is not only to propel young researchers in their career by migrating them across Europe, but also to pull research teams together across Europe. In both aspects the ESMN has been very successful, but in the research highlights selected here we concentrate on ESMN Fellow exploits whereas the large amount of communal ESMN research and networking activity is amply recorded in the collaborative campaigns lists, the meetings lists, and the Fellow and the Associated-State travel lists that are supplied for ESMN Year 4 in this report and were supplied for the preceding ESMN years in our preceding reports, and above all is amply documented in the many joint ESMN papers specified with full authorship breakdown in the complete reference list on pp. 39 ff.

ESMN research area: in retrospect, during the past four years (or perhaps one should extend this period with the preceding four years of the ESMN-1) one cannot but come to the overall conclusion that the ESMN stood amidst what is widely experienced as the golden age of solar physics – by no means over yet. During ESMN-1 solar physics was on the upswing worldwide, a rejuvenation of a field that had spawned astrophysics but became bogged down in the complexities of solar activity phenomena. No wonder, since these combine intricacies of optically-thick radiative transfer, magnetohydrodynamics, and plasma physics. The Sun is the only star close enough to appreciate this astoundingly rich display of what nature manages to produce out of basic physics equations in stellar atmospheres. Of course, other stars behave similarly but they appear smaller in our telescopes than the small detail we resolve on the Sun.

The three major developments which caused this blossoming were the incredible success of the SOHO mission in space, the unprecedented developments in advanced image restoration and polarimetry techniques at groundbased optical telescopes, and the dramatic advent of realistic numerical modelling in polarimetric data inversion, radiation hydrodynamics, and magnetohydrodynamics (MHD). All three grew yet further throughout the ESMN-2 duration and through ESMN collaborations. Many ESMN campaigns added solar observing from space with the TRACE mission to SOHO's data gathering in conjunction with groundbased observing. The latter provided new vistas of the solar atmosphere through image sequences of unprecedented sharpness, in particular those taken with the SST using adaptive optics and the new ESMN-developed MOMFBD image restoration technique. Quantitative spectropolarimetry advanced through multi-line observing, sophisticated Stokes data inversion, and further development of weak-field diagnostics. Numerical MHD modelling triumphed by explaining the long-studied appearance of magnetic elements in the solar network and in faculae in realistic and convincing detail.

The upswing continues; it is most regrettable that the ESMN must now terminate for lack of further funding. Its end date in fact coincides with the start of a new era in solar physics, initiated by the successful launches of Hinode and NASA's STEREO mission. In the coming years the German GREGOR telescope and NASA's SDO mission will add new dimensions to solar physics observing, with the German Sunrise stratospheric balloon telescope, the American Advanced Technology Solar Telescope, and ESA's Solar Orbiter on the further horizon. The EAST initiative documented above should make the European Solar Telescope come true at about the same time. So: upswing in full swing.

Observational highlight: we single out the work of UiO Fellow Luc Rouppe van der Voort as highlight of ESMN observing. He represents an early specimen of the transnational researcher profile the EC is aiming at: he graduated in astronomy at partner UU, obtained his PhD during ESMN-1 at partner KVA, became the ESMN postdoc at partner UiO, and presently continues his work there on other funding. He has evolved into a productive observer, well-known for getting the most out of the SST. His recent reformulation with his colleagues Michiel van Noort (also UU-educated, then postdoc at UiO, now at KVA) and Mats Löfdahl (KVA) of the latter's numerical wavefront restoration method called "phase-diverse multi-frame blind deconvolution" into phase-diverse MOMFBD (where MO stands for the addition of Multi Object, a very clever trick), is likely to become a most important workhorse for all groundbased solar physics. Indeed, during the very last week of the ESMN he and Van Noort visited partner OAA to teach them how to use the code (publicly available at http://www.momfbd.org) on data from

OAA's Fabry-Perot interferometer IBIS, and he is assisting partner IAC in MOMFBD processing of their SST data. Pertinent refereed Rouppe van der Voort papers (in time order; numbers correspond to the list on pp. 39 ff): [178] = discovery of penumbral dark cores, [158] = time variability of the Evershed effect, [161] = observations of umbral flashes, [160] = penumbra at 0.1″ resolution, [24] = magnetic elements at 0.1″ resolution, [159] = magnetic element dynamics, [196] = spectroscopy of fluxtubes, [46] = dynamics of faculae, [82] = observations and modelling of dynamic fibrils, [118] = thin threads of filaments, [119] = filaments and the supergranular network, [231] = Multi-Object Multi-Frame Blind Deconvolution with phase diversity, [232] = observations of fast events in the chromosphere, [47] = observations and modelling of dynamic fibrils, [23] = solar faculae contrast.

Magnetometry highlight: for this ESMN topic we select the work of two ESMN Fellows, Laura Merenda and Andrés Asensio Ramos, who went from OAA to IAC for predoc and from IAC to OAA for postdoc training, respectively. Their work focused (and focuses) on the theoretical interpretation of spectropolarimetric observations and the development and application of sophisticated plasma diagnostic tools in order to yield insight in solar and stellar magnetism. In her PhD thesis work as ESMN Fellow Laura Merenda developed a Stokes inversion code for retrieving the vector magnetic field of chromospheric structures from spectropolarimetric observations in the He I 10830 Å multiplet. She carried out several observing campaigns with TIP on the VTT targeting prominences and coronal filaments; her Stokes inversion of these data yielded breakthroughs in our understanding of the magnetic plasma confinement in these structures. Andrés Asensio Ramos obtained his prize-winning PhD at the IAC on polarised radiative transfer in molecular lines, with emphasis on non-equilibrium chemistry and numerical modeling of the molecular Zeeman effect and scattering polarisation. His subsequent work as ESMN Fellow at partner OAA (presently continuing at IAC) focused on the further development and application of Hanle-effect plasma diagnostic tools, which yielded important advances in our understanding of solar magnetism but extended also to stellar magnetism, such as the explanation of enigmatic VLBI observations of SiO polarisation in circumstellar envelopes. Pertinent refereed Merenda and Asensio Ramos papers (in time order; numbers correspond to the list on pp. 39 ff): [5] = non-equilibrium CO chemistry, [223] = hidden quiet-sun magnetism, [6] = discovery of anomalous CN Polarisation, [222] = Hanle and Zeeman in spicules, [2] = SiO dichroic masers, [3] = neural network for chemical equilibrium, [62] = new radiative-transfer method,, [130] = near-vertical fields in a solar-crown prominence.

Interpretational highlight: since most ESMN Fellows can be classified as having worked (and generally still working) in interpretation, our choice to highlight the work of Arkadiusz ("Arek") Berlicki is partially made on the premise that he was an ESMN Fellow at both UU and OP, represents the growing and welcome integration into European solar physics of Associated-State scientists, and developed into a highly productive team member during his ESMN sojourn who now enriches his home institution at Wroclaw University in Poland with a considerable network of Europe-wide contacts. His research addressed (and addresses) flares, in particular re heating, dynamics, and pre-flare topology. He interpreted multi-diagnostic observations with THEMIS, RHESSI, SOHO and TRACE through magnetic field topology extrapolation with the NLTE radiative transfer modelling code developed at AsU, producing semi-empirical models of the flaring chromosphere. Pertinent refereed Berlicki papers (in time order; numbers correspond to the list on pp. 39 ff): [26] = X-ray heating of the chromosphere, [31] = flare evolution and

heating, [27] = non-LTE modelling of the velocity field in flares, [115] = thermal and non-thermal heating in flares, [116] = chromospheric line profiles, [50] = evaporation in solar flares, [117] = the role of the magnetic configuration in flares, [51] = velocity pattern in a flare, [29] = comparison of the magnetic field in THEMIS and SOHO data, [184] = pre-flare magnetic field evolution, [63] = X-ray asymmetry in flare footpoints, [197] = soft and hard X-ray emission from flares.

Theory highlight: our selection is the PhD thesis by Boris Gudiksen. Obviously it should be *hors concours* as not being produced by the present ESMN because Gudiksen was an ESMN-1 Fellow rather than an ESMN-2 one. Nevertheless, because his thesis, "The coronal heating problem", which earned him the Swedish prize for the best physics thesis in 2004, is widely seen as a breakthrough of numerical modeling of coronal heating through magnetic reconnection and since it appeared in the middle of the ESMN-2 period, we include his work here and his thesis with the five best ESMN papers below. The heating of the solar corona is one of the major classical problems of solar physics. It took decades during the first half of the past century to establish the fact (by Walter Grotrian, director of the AIP predecessor) that the corona has a temperature of a million K whereas the solar surface below irradiates it with light representing a temperature of only 6000 K – the pearly-white corona seen during total eclipses. Although it has been clear since the 1970s (when heating by sound waves was ruled out) that this tremendous but counterintuitive heating must be due to solar magnetism as agent, the mechanism was much debated ever since. Gudiksen's thesis is a significant step forward by demonstrating unequivocally that magnetic reconnection is the principal process. It is listed below as ESMN paper [78].

A.2 Joint Publications and Patents

All ESMN publications which appeared during the fourth ESMN year or are presently in press are listed below within this section, ordered alphabetically as to the first author. In addition, we supply a complete numbered list of all ESMN-2 publications as an appendix to this report. As in our earlier reports, both lists contain full specification of the ESMN Fellow and partner authorships and include all:

- ESMN-acknowledging multi-partner papers
- ESMN-acknowledging single-partner papers from ESMN Fellows
- ESMN-acknowledging single-partner papers from New-Member-state partners (called "Associated-State" partners from Eastern Europe in the FP5 terminology still applicable here).

The last category (ESMN-acknowledging single-partner papers) is again added for the Associated-State partners to show their ESMN affinity because they participate as minor partner without ESMN Fellow funding. As also specified in our ESMN Year-1 Report, the only paper without ESMN acknowledgement in the complete list is [178] which was written during the interim between ESMN-1 and ESMN-2 but combined ESMN Fellows from both incarnations.

Web links: virtually all papers, certainly those in regular astronomy journals (*Astronomy & Astrophysics, Astrophysical Journal, Astrophysical Journal Letters, Solar Physics*), can be accessed at URL http://adsabs.harvard.edu/default_service.html/ by simply entering an author's

name.

There were no ESMN patent applications or awards in Year 4 nor in the preceding ESMN years.

Five selected ESMN papers

After some deliberation, the ESMN selected the following ESMN papers as "*most significant joint publications which are considered to have had* (better: have and will have!) *a high impact*". Copies of these papers are included with this report. The choice remains rather arbitrary; we have selected ones that go together with the Fellow highlights selected above. As commented there, the first is partially a tribute to ESMN-1, which we deem appropriate since many of us view the ESMN as an eight-year presence in our research area.

1. ESMN paper [78]
   Gudiksen, B. V.: 2004, *The coronal heating problem*, Ph.D. Thesis Stockholm University
   • *Boris Gudiksen: ESMN-1 KVA Fellow*
   • *Objectives (c), (f)*
2. ESMN paper [223]
   Trujillo Bueno, J., Shchukina, N., and Asensio Ramos, A.: 2004, "A Substantial Amount of Hidden Magnetic Energy in the Quiet Sun", *Nature* **430**, 326–329
   • *Trujillo Bueno: IAC; Asensio Ramos: OAA Fellow*
   • *Objectives (a), (c), (d), (f)*
3. ESMN paper [24]
   Berger, T. E., Rouppe van der Voort, L. H. M., Löfdahl, M. G., Carlsson, M., Fossum, A., Hansteen, V. H., Marthinussen, E., Title, A., and Scharmer, G.: 2004, "Solar magnetic elements at 0.1 arcsec resolution. General appearance and magnetic structure", *Astronomy & Astrophysics* **428**, 613–628
   • *Rouppe van der Voort: UiO Fellow; Hansteen, Carlsson, Fossum, Marthinussen, van Noort: UiO; Löfdahl, Scharmer: KVA*
   • *Objectives (a), (b), (c), (e); collaboration with industry*
4. ESMN paper [27]
   Berlicki, A., Heinzel, P., Schmieder, B., Mein, P., and Mein, N.: 2005a, "Non-LTE diagnostics of velocity fields during the gradual phase of a solar flare", *Astronomy & Astrophysics* **430**, 679–689
   • *Berlicki: OP Fellow; Heinzel: AsU; Schmieder: OP & UiO; Mein, Mein: OP*
   • *Objectives (b), (f)*
5. ESMN paper [130]
   Merenda, L., Trujillo Bueno, J., Landi Degl'Innocenti, E., and Collados, M.: 2006, "Determination of the Magnetic Field Vector via the Hanle and Zeeman Effects in the He I λ10830 Multiplet: Evidence for Nearly Vertical Magnetic Fields in a Polar Crown Prominence", *Astrophysical Journal* **642**, 554–561
   • *Merenda: IAC Fellow; Trujillo Bueno, Collados: IAC; Landi Degl'Innocenti: OAA*
   • *Objectives (a), (f)*

Year-4 ESMN publications

Asensio Ramos, A., Janssen, K., Cauzzi, G., and Reardon, K.: 2006, "High-resolution IBIS Observations and Comparison with 3D Simulations", *Memorie della Societa Astronomica Italiana Supplement* **9**, 59
• *Asensio Ramos, Janssen: OAA Fellows; Cauzzi, Reardon: OAA*
• *Objectives (a), (f)*

Asensio Ramos, A. and Trujillo Bueno, J.: 2006, "Very Efficient Methods for Multilevel Radiative Transfer in Atomic and Molecular Lines", in P. Stee (Ed.), *EAS Publications Series*, 25–48
• *Asensio Ramos: OAA Fellow & IAC; Trujillo Bueno: IAC*
• *Objective (f)*

Ataç, T., Özgüç, A., and Rybák, J.: 2005, "Intermediate-Term Periodicities in Some Solar Activity Indices during Cycle 23", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 151–154
• *Rybák: AISAS*
• *Objective (b)*

Ataç, T., Özgüç, A., and Rybák, J.: 2006, "Periodicities in Irradiance and in other Solar Activity Indices During Cycle 23", *Solar Physics* **237**, 433–444
• *Rybák: AISAS*
• *Objective (b)*

Badalyan, O. G., Obridko, V. N., and Sýkora, J.: 2005a, "Quasi-Biennial Oscillations in the N-S Asymmetry of Solar Activity", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 152–155
• *Sýkora: AISAS*
• *Objective (b)*

Badalyan, O. G., Obridko, V. N., and Sýkora, J.: 2005b, "Temporal Variations of the Solar Corona Rotation", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 50–53
• *Sýkora: AISAS*
• *Objective (b)*

Balthasar, H. and Bommier, V.: 2007, "Simultaneous Polarimetric Observations with VTT and THEMIS", in F. Kneer, K. G. Puschmann, and A. D. Wittmann (Eds.), *Modern Solar Facilities – Advanced Solar Science*, Universitätsverlag Göttingen, in press
• *Balthasar: AIP; Bommier: OP;*
• *Objectives (a), (b), (c), (e), (f)*

Balthasar, H., von der Lühe, O., Kneer, F., Staude, J., Volkmer, R., Berkefeld, T., Caligari, P., Collados, M., Halbgewachs, C., Heidecke, F., Hofmann, A., Klvaňa, M., Nicklas, H., Popow, E., Puschmann, K., Schmidt, W., Sobotka, M., Soltau, D., , Strassmeier, K., and Wittmann, A.: 2007, "GREGOR - the New German Solar Telescope", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Balthasar, Hofmann, Popow, Staude: AIP; Sobotka, Klvaňa: AsU; Collados: IAC;*
• *Objective (d)*

Belluzzi, L., , Landi Degl'Innocenti, E., and Trujillo Bueno, J.: 2007a, "Theoretical Investigation of the Polarization Properties of the D_2 Lines of Alkali Atoms", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Belluzzi, Landi Degl'Innocenti: OAA; Trujillo Bueno: IAC*
• *Objectives (f)*

Belluzzi, L., Trujillo Bueno, J., and Landi Degl'Innocenti, E.: 2007b, "The Hanle and Zeeman Effects in the Ba II D_2 Line", in R. Casini and B. W. Lites (Eds.), *Solar Polarization 4*, Astronomical Society Pacific Conference Series, in press
• *Belluzzi, Trujillo Bueno: IAC; Landi Degl'Innocenti: OAA,*
• *Objective (f)*

Berger, T. E., Rouppe van der Voort, L., and Löfdahl, M.: 2007, "Contrast analysis of solar faculae and magnetic bright points", *Astrophysical Journal* , submitted
• *Rouppe van der Voort: UiO Fellow; Löfdahl: KVA*
• *Objectives (a), (b), (f); collaboration with industry*

Berlicki, A.: 2007, "Observations and modelling of line asymmetries in chromospheric flares", in P. Heinzel, I. Dorotovic, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Berlicki: UU fellow*
• *Objectives (b), (f)*

Berlicki, A., Mein, P., and Schmieder, B.: 2005a, "Active Region Magnetic Field Observed with THEMIS/MSDP and SOHO/MDI Instruments", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 57
• *Berlicki: OP & UU Fellow; Mein, Schmieder: OP*
• *Objectives (a), (b), (d)*

Berlicki, A., Mein, P., and Schmieder, B.: 2006, "THEMIS/MSDP magnetic field measurements", *Astronomy & Astrophysics* **445**, 1127–1132
• *Berlicki: OP & UU Fellow; Mein, Schmieder: OP*
• *Objectives (a), (b), (d), (f)*

Berlicki, A., Schmieder, B., Heinzel, P., Li, H., Del Zanna, G., and Rudawy, P.: 2005b, "Multi-Wavelength Analysis of Plasma Flows during Solar Flares", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 58
• *Berlicki: OP & UU Fellow; Schmieder: OP; Heinzel: ASU*
• *Objectives (a), (b), (e)*

Bettonvil, F. C. M., Hammerschlag, R. H., Sütterlin, P., Rutten, R. J., Jägers, A. P. L., and Sliepen, G.: 2006, "Tunable H-alpha Lyot filter with advanced servo system and image processing: instrument design and new scientific results with the Dutch Open Telescope", in I. S. McLean and M. Iye (Eds.), *Ground-based and Airborne Instrumentation for Astronomy*, Procs. SPIE 6269, paper 62690E
• *Bettonvil, Hammerschlag: UU; Sütterlin: ESMN-1 UU Fellow; Rutten: UU & UiO*
• *Objective (d)*

Bommier, V., Landi Degl'Innocenti, E., Feautrier, N., and Molodij, G.: 2006a, "Collisional influence on the differential Hanle effect method applied to the second solar spectrum of the $A^2\Pi$-$X^2\Sigma^+$ (0, 0) band of MgH", *Astronomy & Astrophysics* **458**, 625–633
• *Bommier, Molodij: OP; Landi Degl'Innocenti: OAA*
• *Objective (f)*

Bommier, V., Landi Degl'Innocenti, E., Landolfi, M., and Molodij, G.: 2006b, "The Solar Intranetwork Magnetic Field: a Resolved Turbulent Field", *Astronomy & Astrophysics* , in press
• *Bommier, Molodij: OP; Landi Degl'Innocenti, Landolfi: OAA*
• *Objectives (a), (f)*

Cauzzi, G., Asensio Ramos, A., Reardon, K., and Janssen, K.: 2005, "Quiet Solar Photosphere: Comparisons of High Resolution Observations with 3-D Simulations", in *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600
• *Asensio Ramos, Janssen: OAA Fellows; Cauzzi, Reardon: OAA*
• *Objectives (a), (f)*

Cauzzi, G., Asensio Ramos, A., Reardon, K. P., and Janssen, K.: 2007a, "Solar High Resolution Spectral Observations Compared with Numerical Simulations", in F. Kupka and I. Roxburg (Eds.), *Convection in Astrophysics*, IAU Symposium 239, in press
• *Asensio Ramos: OAA Fellow & IAC; Cauzzi, Reardon, Janssen: OAA*
• *Objectives (a), (f)*

Cauzzi, G., Vecchio, A., Reardon, K., Janssen, K., and Rimmele, T.: 2007b, "Acoustic shocks in the quiet solar chromosphere ", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Janssen: OAA Fellow; Cauzz, Vecchio, Reardon: OAA*
• *Objectives (a), (c)*

Chatterjee, P., Choudhuri, A., and Petrovay, K.: 2006, "Development of twist in an emerging magnetic flux tube by poloidal field accretion", *Astronomy & Astrophysics* **449**, 781–789
• *Petrovay: ELTE*
• *Objectives (b), (c)*

De Pontieu, B., Carlsson, M., Stein, R., Rouppe van der Voort, L., Löfdahl, M., van Noort, M., Nordlund, Å., and Scharmer, G.: 2006, "Rapid Temporal Variability of Faculae: High-Resolution Observations and Modeling",

Astrophysical Journal **646**, 1405–1420
• *Carlsson: UiO; Rouppe van der Voort: UiO Fellow; Löfdahl, Scharmer: KVA*
• *Objectives (a), (b), (f); collaboration with industry*

De Pontieu, B., Hansteen, V. H., Rouppe van der Voort, L., van Noort, M., and Carlsson, M.: 2007, "High resolution observations and modeling of dynamic fibrils", *Astrophysical Journal* 655
• *Hansteen, Carlsson: UiO; Rouppe van der Voort: UiO Fellow; van Noort: UiO & KVA*
• *Objectives (a), (b), (c), (f); collaboration with industry*

Del Zanna, G., Berlicki, A., Schmieder, B., and Mason, H. E.: 2006, "A Multi-Wavelength Study of the Compact M1 Flare on October 22, 2002", *Solar Physics* **234**, 95–113
• *Berlicki: OP & UU Fellow; Schmieder: OP*
• *Objectives (a), (b), (f)*

Del Zanna, G., Schmieder, B., Mason, H., Berlicki, A., and Bradshaw, S.: 2007, "The gradual phase of the X17 flare on October 28, 2003", *Solar Physics* **240**, in press
• *Schmieder: OP; Berlicki: OP & UU Fellow*
• *Objectives (a), (e)*

Derouich, M.: 2006a, "Anisotropic collisions and impact circular polarization. Application to the solar Halpha line", *Astronomy & Astrophysics* , in press
• *Derouich: IAC Fellow*
• *Objectives (a), (f)*

Derouich, M.: 2006b, "Collisional depolarization of molecular lines. Application to the SiO+H isotropic collisions", *Astronomy & Astrophysics* **449**, 1–7
• *Derouich: IAC Fellow*
• *Objective (f)*

Derouich, M.: 2007, "Calculation of Depolarization and Polarization Rates by Isotropic Collisions with Neutral Hydrogen", in R. Casini and B. Lites (Eds.), *Astronomical Society Pacific Conference Series*, in press
• *Derouich: IAC Fellow*
• *Objective (f)*

Derouich, M., Barklem, P. S., and Sahal-Bréchot, S.: 2005, "Spin depolarizing effect in collisions with neutral hydrogen II. Application to simple/complex ions in spherically symmetric states", *Astronomy & Astrophysics* **441**, 395
• *Derouich: IAC Fellow*
• *Objective (f)*

Derouich, M., Bommier, V., Malherbe, J. M., and Landi Degl'Innocenti, E.: 2006, "Second solar spectrum of the Sr I 4607 Å line: depth probing of the turbulent magnetic field strength in a quiet region", *Astronomy & Astrophysics* **457**, 1047–1052
• *Derouich: IAC Fellow; Bommier, Malherbe: OP; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

Derouich, M., Bommier, V., Malherbe, J. M., Landi Degl'Innocenti, E., and Sahal-Bréchot, S.: 2007, "Interpretation of second solar spectrum observed at the Pic-du-Midi and THEMIS", in R. Casini and B. W. Lites (Eds.), *Solar Polarization 4*, Astronomical Society Pacific Conference Series, in press
• *Derouich: IAC Fellow; Bommier, Malherbe, Sahal-Bréchot: OP; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

Elitzur, M. and Asensio Ramos, A.: 2006, "A new exact method for line radiative transfer", *MNRAS* **365**, 779–791
• *Asensio Ramos: OAA Fellow*

Falewicz, R., Siarkowski, M., and Berlicki, A.: 2006, "Hard X-ray emission at the footpoints of solar flares", *Advances in Space Research* **38**, 956–961
• *Berlicki: OP & UU Fellow*
• *Objectives (a), (b)*

Fárník, F. and Karlický, M.: 2007, "Spatial structure and spectra of X-ray sources during the 0.8–4.5 GHz reverse

drift bursts observations", *Solar Physics* , in press
• Fárník, Karlický: AsU
• *Objective (c)*

Forgács-Dajka, E., Major, B., and Borkovits, T.: 2006, "Searching for mid-term variations in different aspects of solar activity — looking for probable common origins and studying temporal variations of magnetic polarities", *MNRAS* , in press
• *Forgács-Dajka, Major, Borkovits: ELTE*
• *Objectives (a), (b)*

Forgács-Dajka, E. and Borkovits, T.: 2006, "Searching for common mid-term variations in different aspects of solar activity", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, 80
• *Forgács-Dajka, Borkovits: ELTE*
• *Objectives (b), (c)*

Gömöry, P.: 2006, *Variability and energy transfer in the transition region of the quiet solar atmosphere*, Ph.D. Thesis, Comenius University, Bratislava
• *Gömöry: AISAS*
• *Objective (c)*

Gömöry, P. and Balthasar, H.: 2007, "Magnetic Vector Field above a Sunspot", in F. Kneer, K. G. Puschmann, and A. D. Wittmann (Eds.), *Modern Solar Facilities – Advanced Solar Science*, Universitätsverlag Göttingen, in press
• *Gömöry: AIP Fellow*
• *Objectives (a), (b), (f)*

Gömöry, P., Rybák, J., Kučera, A., Curdt, W., and Wöhl, H.: 2006, "SOHO/CDS observations of waves above the network", *Astronomy & Astrophysics* **448**, 1169–1175
• *Gömöry, Rybák, Kučera: AISAS*
• *Objective (c)*

Gömöry, P., Rybák, J., Kučera, A., Curdt, W., and Wöhl, H.: 2007, "Propagating Waves Detected in the Chromospheric Network", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Gömöry, Rybák, Kučera: AISAS*
• *Objective (c)*

Gömöry, P., Rybák, J., Kučera, A., and Wöhl, H.: 2005, "Analysis of Dynamics of Loops in an Active Region Associated with a Small C-Class Flare", in D. E. Innes, A. Lagg, and S. K. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596, 56–59
• *Gömöry, Rybák, Kučera: AISAS*
• *Objectives (b)*

Gunár, S., Schmieder, B., and Heinzel, P.: 2007, "Prominence parameters derived by 2D modeling from hydrogen Lyman series measured by SOHO/SUMER", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Schmieder: OP; Heinzel, Gunár: AsU
• *Objective (a)*

Hammerschlag, R. H., Bettonvil, F. C. M., Jägers, A. P. L., and Rutten, R. J.: 2007, "Aperture Increase Options for the Dutch Open Telescope", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Hammerschlag, Bettonvil: UU; Rutten: UU & UiO,*
• *Objective (d)*

Hansteen, V. H., De Pontieu, B., Rouppe van der Voort, L., van Noort, M., and Carlsson, M.: 2006, "Dynamic Fibrils Are Driven by Magnetoacoustic Shocks", *Astrophysical Journal Letters* **647**, L73–L76
• *Hansteen, Carlsson: UiO; Rouppe van der Voort: UiO Fellow; van Noort: UiO & KVA*
• *Objectives (a), (b), (c), (f); collaboration with industry*

Heinzel, P.: 2007, "The Fine Structure of Solar Prominences", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Heinzel: AsU
• *Objective (a)*

Heinzel, P., Schmieder, B., and Vial, J.: 2007, "What have we learned about prominences and filaments from SOHO/SUMER and CDS spectral observations?", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, in press
• *Schmieder: OP, Heinzel: AsU*
• *Objectives (a), (b), (e)*

Janssen, K. and Cauzzi, G.: 2006, "Dynamics of the solar photosphere with IBIS. I. Reversed intensity structure in the mid-photosphere", *Astronomy & Astrophysics* **450**, 365–374
• *Janssen: OAA Fellow; Cauzzi: OAA*
• *Objectives (a), (c)*

Janssen, K. and Cauzzi, G.: 2007a, "Reversed granulation", in F. Kneer, K. G. Puschmann, and A. D. Wittmann (Eds.), *Modern Solar Facilities – Advanced Solar Science*, Universitätsverlag Göttingen, in press
• *Janssen: OAA Fellow; Cauzzi: OAA*
• *Objective (a)*

Janssen, K. and Cauzzi, G.: 2007b, "Reversed Granulation In Mid-Photosphere Of The Sun", in F. Kupka and I. Roxburg (Eds.), *Convection in Astrophysics*, IAU Symposium 239, in press newline • *Janssen: OAA Fellow; Cauzzi: OAA*
• *Objectives (a), (c)*

Jurčák, J., Martínez Pillet, V., and Sobotka, M.: 2006a, "The magnetic canopy above light bridges", *Astronomy & Astrophysics* **453**, 1079–1088
• *Jurčák, Sobotka: AsU; Martínez Pillet: IAC*
• *Objective (b)*

Jurčák, J., Sobotka, M., and Martínez Pillet, V.: 2005, "The Magnetic Configuration in Light Bridges", in *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600
• *Jurčák, Sobotka: AsU; Martínez Pillet: IAC*
• *Objective (b)*

Jurčák, J., Sobotka, M., and Martínez Pillet, V.: 2006b, "The Canopy Structure above Light Bridges", *Central European Astrophysical Bulletin* **30**, 55–64
• *Jurčák, Sobotka: AsU; Martínez Pillet: IAC*
• *Objective (b)*

Kashapova, L. K., Kotrč, P., and Kupryakov, Y. A.: 2007, "Diagnostics of accelerated particle beams by spectral observations in Balmer series lines", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Kotrč: AsU
• *Objective (a)*

Kašparová, J., Varady, M., Karlický, M., Heinzel, P., and Moravec, Z.: 2007, "H-alpha line in solar atmosphere heated by particle beams", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Kašparová, Karlický, Heinzel: AsU
• *Objective (b)*

Kotrč, P.: 2007, "The modernized solar optical spectrograph at the Ondřejov observatory", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Kotrč: AsU
• *Objective (d)*

Koza, J., Kučera, A., Rybák, J., and Wöhl, H.: 2006a, "The height dependence of quiet-sun photospheric tem-

perature fluctuations in observations and simulations", in J. Leibacher, H. Uitenbroek, and R. Stein (Eds.), *Solar MHD Theory and Observations - a High Spatial Resolution Perspective*, Astronomical Society Pacific Conference Series 354, 43–48
• *Koza, Kučera, Rybák: AISAS*
• *Objective (f)*

Koza, J., Kučera, A., Rybák, J., and Wöhl, H.: 2006b, "Photospheric modeling through spectral line inversion. Temperature and radial velocity stratifications and fluctuations", *Astronomy & Astrophysics* **458**, 941–951
• *Koza, Kučera, Rybák: AISAS*
• *Objective (f)*

Koza, J., Kučera, A., Rybák, J., and Wöhl, H.: 2007a, "The Height Dependence of Temperature – Velocity Correlation in the Solar Photosphere", in F. Kneer, K. G. Puschmann, and A. D. Wittmann (Eds.), *Modern Solar Facilities – Advanced Solar Science*, Universitätsverlag Göttingen, in press

Koza, J., Sütterlin, P., Kučera, A., and Rybák, J.: 2007b, "Temporal variation in orientation of fibrils in plage", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Koza, Sütterlin, Kučera, Rybák: AISAS, UU*
• *Objectives (a), (c)*

Kučera, A., Wöhl, H., and Rybák, J.: 2006a, "Spectral Characteristics of a Photosphere near a Flare", *Central European Astrophysical Bulletin* in press
• *Kučera, Rybák: AISAS*
• *Objective (b), (c)*

Kučera, A., Wöhl, H., Rybák, J., Gömöry, P., and Veronig, A.: 2006b, "Multi-wavelength High Resolution Observations of a M5.4 Flare from Ground and Space", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, in press
• *Kučera, Rybák, Gömöry: AISAS*
• *Objective (b), (e)*

Langhans, K.: 2007, "Signatures of penumbral magnetic field at very high spatial resolution", in R. Casini and B. W. Lites (Eds.), *Solar Polarization 4*, Astronomical Society Pacific Conference Series, in press
• *Langhans: KVA Fellow*
• *Objective (a)*

Langhans, K., Scharmer, G. B., Kiselman, D., and Löfdahl, M. G.: 2007, "Observations of dark-cored filaments in sunspot penumbrae", *Astronomy & Astrophysics* , in press
• *Langhans: KVA Fellow; Scharmer, Kiselman, Löfdahl: KVA*
• *Objective (a)*

Leenaarts, J., Rutten, R. J., Carlsson, M., and Uitenbroek, H.: 2006a, "A comparison of proxy-magnetometry diagnostics", *Astronomy & Astrophysics* **452**, L15–L18
• *Leenaarts, UU; Rutten: UU & UiO; Carlsson: UiO*
• *Objectives (a), (d), (f)*

Leenaarts, J., Rutten, R. J., Sütterlin, P., Carlsson, M., and Uitenbroek, H.: 2006b, "DOT tomography of the solar atmosphere VI. Magnetic elements as bright points in the blue wing of Hα", *Astronomy & Astrophysics* **449**, 1209–1218
• *Leenaarts: UU; Rutten: UU & UiO; Sütterlin: UU; Carlsson UiO*
• *Objectives (a), (d), (f)*

Li, H., Li, J.-P., Fang, C., Schmieder, B., Berlicki, A., and Du, Q.-S.: 2005, "A Multi-Wavelength Study of the 3B/X1.2 Flare Observed on 2003 October 26", *Chinese Journal of Astronomy and Astrophysics* **5**, 645–664
• *Berlicki: OP fellow, Schmieder: OP*
• *Objectives (a), (b), (d)*

Li, H., Schmieder, B., Aulanier, G., and Berlicki, A.: 2006, "Is Pre-Eruptive Null Point Reconnection Required for Triggering Eruptions?", *Solar Physics* **237**, 85–100

• *Berlicki: OP fellow; Schmieder, Aulanier: OP*
• *Objectives (a), (b)*

Manso Sainz, R., Landi Degl'Innocenti, E., and Trujillo Bueno, J.: 2006, "A qualitative interpretation of the second solar spectrum of Ce II", *Astronomy & Astrophysics* **447**, 1125–1129
• *Manso Sainz, Trujillo Bueno: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

Merenda, L., Trujillo Bueno, J., and Collados, M.: 2007, "A Magnetic Map of a Solar Coronal Filament", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Merenda: IAC Fellow; Trujillo Bueno, Collados: IAC,*
• *Objectives (a), (f)*

Merenda, L., Trujillo Bueno, J., Landi degl'Innocenti, E., and Collados, M.: 2005, "Determination of the Magnetic Field Vector in a Polar Crown Prominence via the Hanle and Zeeman Effects in the He I 10830 Å Multiplet.", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Merenda: IAC Fellow; Trujillo Bueno, Collados: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

Merenda, L., Trujillo Bueno, J., Landi Degl'Innocenti, E., and Collados, M.: 2006, "Determination of the Magnetic Field Vector via the Hanle and Zeeman Effects in the He I λ10830 Multiplet: Evidence for Nearly Vertical Magnetic Fields in a Polar Crown Prominence", *Astrophysical Journal* **642**, 554–561
• *Merenda: IAC Fellow; Trujillo Bueno, Collados: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

Mészárosová, H., Karlický, M., Rybák, J., Farnik, F., and Jiřička, K.: 2006, "Long period variations of dm-radio and X-ray fluxes in three X-class flares", **460**, 865–874
• *Rybák: AISAS, Mészárosová, Karlický, Farnik, Jiřička: AsU*
• *Objective (b)*

Mészárosová, H., Rybák, J., Zlobec, P., Magdalenić, J., Karlický, M., and Jiřička, K.: 2005, "Statistical Analysis of Pulsations and Pulsations with Fibers in the Range 800-2000 MHZ", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 133–136
• *Rybák: AISAS, Mészárosová, Karlický, Farnik, Jiřička: AsU*
• *Objective (b)*

Odert, P., Hanslmeier, A., Rybák, J., Kučera, A., and Wöhl, H.: 2005, "Influence of the 5-min oscillations on solar photospheric layers. I. Quiet region", *Astronomy & Astrophysics* **444**, 257–264
• *Rybák, Kučera: AISAS*
• *Objective (b)*

Pariat, E., Schmieder, B., Berlicki, A., and Lopez-Ariste, A.: 2007, "Spectro photometry of Ellerman Bombs observed with THEMIS", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Schmieder, Demoulin, Pariat: OP; Berlicki: OP & UU Fellow*
• *Objectives (a), (b)*

Petrovay, K.: 2005, "The Sun as a laboratory for turbulence theory: the problem of anomalous diffusion", *Pub. Astronomy Dept. Eotvos Lorand Univ.* **15**, 53–58
• *Petrovay: ELTE*
• *Objectives (b), (c)*

Petrovay, K., Chaterjee, P., and Choudhuri, A.: 2006, "Helical Magnetic Fields in Solar Active Regions: Theory vs. Observations", *Publ. Astronomy Dept. Eotvos Lorand Univ.* **17**, 5
• *Petrovay: ELTE*
• *Objectives (a), (b)*

Petrovay, K., Chaterjee, P., and Choudhuri, A.: 2006a, "On The Origin of Current Helicity in Active Regions", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, 46
• *Petrovay: ELTE*
• *Objective (b)*

Petrovay, K., Erdélyi, R., and Thompson, M.: 2006b, "Sound Wave Travel Times in Plage Areas - The Effect of Abnormal Granulation", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, 52
• *Petrovay: ELTE*
• *Objectives (a), (c)*

Petrovay, K., Erdélyi, R., and Thompson, M.: 2006c, "The Effect of Abnormal Granulation on Acoustic Wave Travel Times and Mode Frequencies", *Solar Physics* , in press
• *Petrovay: ELTE*
• *Objectives (a), (c)*

Prosecký, T., Kotrč, P., and Berlicki, A.: 2006, "On Line Profile Asymmetries in a Solar Flare", *Central European Astrophysical Bulletin* **30**, 31–41
• *Berlicki: OP fellow; Kotrč: AsU*
• *Objectives (a), (f)*

Ramelli, R., Bianda, M., Trujillo Bueno, J., Merenda, L., and Stenflo, J. O.: 2005, "Spectropolarimetric Observations of Prominences and Spicules and Magnetic Field Diagnostics", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Merenda: IAC Fellow; Trujillo Bueno: IAC*
• *Objectives (a), (f)*

Reardon, K., Casini, R., Cavallini, F., Tomczyk, S., Rouppe van der Voort, L., Van Noort, M., Woeger, F., Socas Navarro, H., and IBIS Team: 2006, "High Resolution Spectropolarimetry of Penumbral Formation with IBIS", in *AAS/Solar Physics Division Meeting*, 35.03
• *van Noort: KVA; Rouppe van der Voort: UiO Fellow*
• *Objective (d)*

Régnier, S. and Canfield, R. C.: 2005a, "Describing Coronal Magnetic Fields by Successive Force-Free Equilibia", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Régnier: ESA Fellow*
• *Objectives (b), (f)*

Régnier, S. and Canfield, R. C.: 2005b, "Evidence of Small Scale Reconnection in a Moving Feature", in *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600
• *Régnier: ESA Fellow*
• *Objectives (b), (f)*

Régnier, S. and Canfield, R. C.: 2006, "Evolution of magnetic fields and energetics of flares in active region 8210", *Astronomy & Astrophysics* **451**, 319–330
• *Régnier: ESA Fellow*
• *Objectives (b), (f)*

Régnier, S., Fleck, B., Abramenko, V., and Zhang, H.-Q.: 2005, "Evolution of the Magnetic Energy Budget in AR 10486 from Potential and Nonlinear Force-Free Models", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Régnier: ESA Fellow*
• *Objectives (b), (f)*

Rybák, J., Kučera, A., Wöhl, H., Wedemeyer-Bohm, S., and Steiner, O.: 2006, "A New Method for Comparing Numerical Simulations and Spectroscopic Observations of the Solar Photosphere", in J. Leibacher, H. Uitenbroek, and R. Stein (Eds.), *Solar MHD: Theory and Observations - a High Spatial Resolution Perspective*, Astronomical Society Pacific Conference Series 354, 80–85
• *Rybák, Kučera: AISAS*

• *Objective (b)*

Sánchez-Andrade Nuño, B., Puschmann, K. G., Cuberes, M. S., Blanco Rodríguez, J., and Kneer, F.: 2005a, "Chromospheric dynamics of a solar active region", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 70
• *Sánchez Cuberes: AIP Fellow*
• *Objectives (b), (c)*

Sánchez-Andrade Nuño, B., Puschmann, K. G., Sánchez Cuberes, M., Blanco Rodríguez, J., and Kneer, F.: 2005b, "Analysis of a Wide Chromospheric Active Region", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Sánchez Cuberes: AIP Fellow*
• *Objectives (b), (c)*

Scharmer, G. B., Langhans, K., Kiselman, D., and Löfdahl, M. G.: 2007, "Recent high resolution observations and interpretations of sunspot fine structure", in K. Shibata, S. Nagata, and T. Sakurai (Eds.), *The New Solar Physics with Solar-B Mission*, Astronomical Society Pacific Conference Series, in press
• *Langhans: KVA Fellow*
• *Objectives (a), (d), (f)*

Schmieder, B., Berlicki, A., Li, H., and et al.: 2005, "Flows and Heating of the Solar Atmosphere during Solar Flares", in *Connecting Sun and Heliosphere*, European Space Agency SP-592, 543
• *Schmieder: OP; Berlicki: OP & UU Fellow*
• *Objectives (a), (b)*

Schmieder, B., Mandrini, C., Démoulin, P., Berlicki, A., and Li, H.: 2007, "Magnetic sources of flares and CMEs from multi-wavelength flare studies", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, in press
• *Schmieder, Demoulin: OP, Berlicki: OP & UU Fellow*
• *Objectives (a), (b)*

Schmieder, B., Mandrini, C. H., Démoulin, P., Pariat, E., Berlicki, A., and Deluca, E.: 2006, "Magnetic reconfiguration before the X 17 Solar flare of October 28 2003", *Advances in Space Research* **37**, 1313–1316
• *Schmieder, Démoulin, Pariat: OP; Berlicki: OP & UU Fellow*
• *Objectives (a), (b), (e)*

Schwartz, P., Heinzel, P., and Schmieder, B.: 2005, "Non-Lte Modelling of the EUV Filament Based on Soho/sumer Observations of the Hydrogen Lyman Lines", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 97
• *Schwartz, Heinzel: ASU; Schmieder: OP*
• *Objectives (a), (b), (f)*

Schwartz, P., Heinzel, P., and Schmieder, B.: 2007, "Importance of absorption and volume blocking for line intensity depression in EUV filaments", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, in press
• *Schmieder: OP, Heinzel, Schwartz: AsU*
• *Objectives (a), (b), (e)*

Schwartz, P., Heinzel, P., Schmieder, B., and Anzer, U.: 2006, "Study of an extended EUV filament using SoHO/SUMER observations of the hydrogen Lyman lines", *Astronomy & Astrophysics* **459**, 651–661
• *Schwartz, Heinzel: ASU; Schmieder: OP*
• *Objectives (a), (b), (f)*

Schwartz, P., Schmieder, B., and Heinzel, P.: 2007, "NLTE diagnostics of a filament observed by SOHO/SUMER in hydrogen Lyman line series", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Schmieder: OP; Heinzel, Schwartz: AsU
• *Objective (a)*

Siarkowski, M., Falewicz, R., and Berlicki, A.: 2006, "Small GOES flares with intense hard X-ray emission",

Advances in Space Research **38**, 972–978
• *Berlicki: OP & UU Fellow*
• *Objectives (a), (b)*

Sobotka, M. and Roudier, T.: 2007, "Horizontal motion in the vicinity of sunspots", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Sobotka: AsU
• *Objective (a)*

Socas-Navarro, H., Trujillo Bueno, J., and Landi Degl'Innocenti, E.: 2006, "Polynomial Approximants for the Calculation of Polarization Profiles in the He I 10830 Å Multiplet (Revision)", *ApJS* **166**, 441–442
• *Trujillo Bueno: IAC; Landi Degl'Innocenti: OAA*
• *Objective (f)*

Štepán, J., Heinzel, P., Kašparová, J., and Sahal-Bréchot, S.: 2006, "Polarization Diagnostics of Proton Beams in Solar Flares", *Cosmic Particle Acceleration, IAU Joint Discussion JD01, Prague, #55*
• Sahal-Bréchot: OP; Štepán, Heinzel, Kašparová: AsU
• *Objective (a)*

Štepán, J., Heinzel, P., and Sahal-Bréchot, S.: 2007, "Impact polarization due to proton beams in solar flares", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Sahal-Bréchot: OP; Heinzel, Štepán: AsU
• *Objective (a)*

Temmer, M., Rybák, J., Bendik, P., Veronig, A., Vogler, F., , Pötzi, W., Otruba, W., and Hanslmeier, A.: 2006a, "Hemispheric Sunspot Numbers 1945–2004: data merging from two observatories", *Central European Astrophysical Bulletin* **30**, 65–73
• *Rybák: AISAS*
• *Objective (b)*

Temmer, M., Rybák, J., Bendik, P., Veronig, A., Vogler, F., Otruba, W., Potzi, W., and Hanslmeier, A.: 2006b, "Hemispheric sunspot numbers Rn and Rs from 1945-2004: catalogue and N-S asymmetry analysis for solar cycles 18-23", *Astronomy & Astrophysics* **447**, 735–743
• *Rybák: AISAS*
• *Objective (b)*

Temmer, M., Rybák, J., Veronig, A., Bendík, P., Vogler, F., Pötzi, W., Otruba, W., and Hanslmeier, A.: 2005, "Hemispheric Sunspot Numbers RN and RS from 1945-2004: Extended and Improved Catalogue", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 52–55
• *Rybák: AISAS*
• *Objective (b)*

Temmer, M., Veronig, A., Rybák, J., Brajša, R., and Hanslmeier, A.: 2006c, "Periodical patterns in major flare occurrence and their relation to magnetically complex active regions", *Advances in Space Research* **38**, 886–890
• *Rybák: AISAS*
• *Objective (b)*

Tomasz, F.: 2006, *Eruptive events in the outer atmosphere of the quiet Sun*, Ph.D. Thesis, Comenius University, Bratislava
• *Tomasz: AISAS*
• *Objective (c)*

Tomasz, F., Régnier, S., Schwartz, P., Rybák, J., Kučera, A., Heinzel, P., Curdt, W., and Wöhl, H.: 2006, "Study of a small-scale eruptive event observed by SOHO/SUMER", in H. Lacoste (Ed.), *SOHO17 - 10 years of SOHO and Beyond*, European Space Agency SP-617
• *Tomasz, Rybák, Kučera: AISAS, Régnier: ESA fellow, Schwartz, Heinzel: AsU*
• *Objective (b)*

Trujillo Bueno, J., Landi Degl'Innocenti, E., Casini, R., and Martínez Pillet, V.: 2005a, "The Scientific Case for Quantum Spectropolarimetry from Space", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Trujillo Bueno, Martínez Pillet: IAC; Landi Degl'Innocenti: OAA*
• *Objective (d)*

Trujillo Bueno, J., Merenda, L., Centeno, R., Collados, M., and Landi Degl'Innocenti, E.: 2005b, "The Hanle and Zeeman Effects in Solar Spicules: A Novel Diagnostic Window on Chromospheric Magnetism", *Astrophysical Journal Letters* **619**, L191–L194
• *Merenda: IAC Fellow; Trujillo Bueno, Collados, Centeno: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

Tziotziou, K., Tsiropoula, G., and Sütterlin, P.: 2005, "DOT tomography of the solar atmosphere V. Analysis of a surge from AR10486", *Astronomy & Astrophysics* **444**, 265–274
• *Tziotziou: UU Fellow; Sütterlin: UU*
• *Objectives (a), (b), (c)*

van Noort, M. J. and Rouppe van der Voort, L. H. M.: 2006, "High-Resolution Observations of Fast Events in the Solar Chromosphere", *Astrophysical Journal Letters* **648**, L67–L70
• *van Noort: UiO & KVA; Rouppe van der Voort: UiO Fellow*
• *Objectives (a), (b), (c)*

Varady, M., Karlický, M., and Kašparová, J.: 2007, "Return current and the energy deposit in flares", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Kašparová, Karlický: AsU
• *Objective (b)*

Vecchio, A., Cauzzi, G., Reardon, K. P., Janssen, K., and Rimmele, T.: 2007, "Solar Atmospheric Oscillations and the Chromospheric Magnetic Topology", *Astronomy & Astrophysics* **461**, L1–L4
• *Janssen: OAA Fellow; Vecchio, Cauzzi, Reardon: OAA*
• *Objectives (a), (c)*

Part B – Comparison with the Joint Programme of Work

In this section we provide detailed Year-4 lists reporting on ESMN campaigns, meetings, and travels as in the previous ESMN reports for the preceding three years. The partner team constitution tables and the assessments cover the whole ESMN-2 duration.

B.1 Research Achievements

The *ESMN research objectives* remained as defined in Section B.1 of Annex I of the contract throughout the ESMN duration. They remained (and remain) relevant. All were covered *in extenso*. The breakdowns added to all ESMN papers in the references on pp. 39 ff specify in detail which ESMN Fellows and scientists published research on what topic.

The ESMN *research methods* were indeed as specified by the tasks definition in Section B.3 of Annex I of the contract, and also the *task breakdown* in the table given there remained valid.

An overview of the *schedule and milestone delivery*:

- *young researcher hiring*: see team tables below and summary table on page 35. Upshot: the ESMN trained 12 young scientists to a total of 281 personmonths, considerably more than the contractual obligation.
- *gender aspects*: 98 personmonths of the 281 young-researcher personmonths were woman-months rather than manmonths – over one-third.
- *science results*: see highlights above and the publications listed on pp. 39 ff.
- *implementation objectives (d) – (f)*: technological advances at all telescopes. They are not detailed here since none was ESMN-funded, but the pertinent websites give more information. ESMN networking contributed significantly, for example to the very close UU–KVA–UiO collaboration which not only led to their USO graduate school but also to much joint development at the SST and DOT on La Palma.
- *effective multi-telescope campaign coordination*: see the list of ESMN campaigns during Year-4 below and the similar lists in the previous reports. This was the major ESMN networking activity.
- *multi-telescope campaigns*: the yearly number became much higher than originally anticipated. The total tally grew to: 12 (Year 1) + 16 (Year 2) + 14 (Year 3) + 17 (Year 4) = 59.
- *summer/winter schools*: three ESMN schools, as planned. Details were given in the previous reports.
- *technological, observing, analysis training*: lots, as is clear from the extensive partnership of ESMN Fellows in ESMN campaigns detailed in their personal travel lists.
- *industrial training*: this did not occur formally, but there were industrial contacts at multiple partners, sometimes intensive and some leading to joint publications notes as such in the reference lists in this report.
- *effective networking*: this is documented through the campaigns lists, the meetings lists, the travel lists, and the networking activity matrices, given below for Year 4 and in the earlier Periodic Progress Reports for Year 1 – 3.

- *presentation training*: all ESMN Fellows presented their work at the Mid-Term Review and at numerous other occasions (see their travel lists below and in the earlier reports). At the Coimbra Conclusion Conference two ESMN Fellows (Tziotziou and Berlicki) were invited Keynote review speakers; other ESMN Fellows presented contributed talks and posters. The ESMN Fellows also participated frequently in public outreach.
- *public outreach*: this year's highlight was the total solar eclipse on March 29, observed by many ESMN-ers and generating considerable media attention. We have not tabulated outreach activities in detail in our yearly reports, but ESMN Fellows as well as ESMN staff members contributed almost without exception in numerous outreach activities such as public lecturing, popular-astronomy article writing, and observatory and telescope excursion guiding.

The *research effort of the participants* is detailed in the team tables below. In continuation of the reporting practice developed in consultation with the Program Officer over the past years, these tables give maximum information by splitting the effort over individual researchers identified by name and including specification of the source of their funding. Of course, most researchers were not funded by the ESMN; for them, the EC's network grant advanced their work through the ESMN collaboration mechanisms and travel allowances.

UU (Utrecht)

Name	Position	Funding	Year 1	Year 2	Year 3	Year 4	Total
Arek Berlicki	Post Doc	ESMN	–	–	–	2	2
Felix Bettonvil	Engineer	NWO/UU	9	10	8	8	35
Catherine Fischer	PhD Student	USO	–	–	–	2	2
Rob Hammerschlag	Staff Engineer	UU	9	8	8	8	33
Július Koza[a]	Post Doc	EIF	–	–	1	10	11
Jorrit Leenaarts	PhD Student	UU	1	4	6	7	18
Rob Rutten	Senior Scientist	UU	6	5	5	5	21
Frans Snik	PhD Student	UU	–	–	2	4	6
Pit Sütterlin	Post Doc	NWO/UU	10	10	10	10	40
Kostas Tziotziou	Post Doc	ESMN	8	12	10	–	30
Alfred de Wijn	PhD Student	UU	7	5	4	5	21
11			50	54	54	61	219

NWO = Nederlandse Organisatie voor Wetenschappelijk Onderzoek
ASTRON = The Netherlands Foundation for Research in Astronomy
EIF = EC FP6 MC Intra-European Felllowship
USO = EC FP6 MC Early Stage Training Utrecht-Stockholm-Oslo Graduate School
[a] Seconded from AISAS starting July 1, 2005

IAC (La Laguna)

Name	Position	Funding	Year 1	Year 2	Year 3	Year 4	Total
Andrés Asensio Ramos	PhD Student/Post Doc	IAC	6	8	2	4	20
Jose Antonio Bonet	Senior Scientist	IAC	3	4	4	3	14
Rebecca Centeno Elliott	PhD Student	IAC	–	–	3	3	6
Manolo Collados Vera	Professor	ULL	6	4	6	4	20
Moncef Derouich	Post Doc	ESMN	–	–	4	12	16
Elena Khomenko	Post Doc	IAC	–	–	3	4	7
Rafael Manso Sainz	Post Doc	IAC	6	2	–	2	10
Marian Martínez González	PhD student	IAC	–	–	3	2	5
Valentin Martínez Pillet	Senior Scientist	IAC	3	2	2	1	8
Laura Merenda	PhD Student	ESMN	8	12	12	12	44
Ines Rodriguez Hidalgo	Assoc. Professor	ULL	3	3	2	1	9
Basilio Ruiz Cobo	Professor	ULL	3	4	2	2	11
Jorge Sánchez Almeida	Senior Scientist	IAC	6	7	6	4	23
Javier Trujillo Bueno	Senior Scientist	CSIC	6	6	6	6	24
14			50	52	55	60	217

CSIC = Consejo Superior de Investigaciones Científicas
ULL = University of La Laguna

OAA (Florence)

Name	Position	Funding	Year 1	Year 2	Year 3	Year 4	Total
Andrés Asensio Ramos	Post Doc	ESMN/MIUR	–	4[a]	10	–	14
Luca Belluzzi	PhD student	UF	–	–	–	10	10
Gianna Cauzzi	Res. Astronomer	OAA/MIUR/CNR	5	7	7	6	25
Fabio Cavallini	Ass. Astronomer	OAA/MIUR	8	8	6	4	26
Ambretta Falchi	Ass. Astronomer	OAA/MIUR	4	2	2	–	8
Cristina Gabellieri	PhD student	UF	–	4	–	–	4
Katja Janssen	Post Doc	ESMN/MIUR	2	12	11[b]	7[c]	32
Egidio Landi Degl'Innocenti	Professor	UF/MIUR	8	8	4	4	24
Marco Landolfi	Astronomer	OAA	6	6	–	2	14
Rafael Manso Sainz	Postdoc	MIUR	2	–	–	–	2
Kevin Reardon	Grad. Researcher	OAA/MIUR	8	4	8	8	28
Antonio Vecchio	Postdoc	OAA	–	–	–	8	8
12			43	55	48	47	195

UF = University of Florence
MIUR = Ministero Istruzione Universitá e Ricerca
CNR = Consiglio Nazionale delle Ricerche
[a] 2 months on ESMN, 2 months on MIUR funding
[b] 10 months on ESMN, 1 month on MIUR funding
[c] MIUR funding

UiO (Oslo)

Name	Position	Funding	Year 1	Year 2	Year 3	Year 4	Total
Mats Carlsson	Professor	UiO	8	8	9	9	34
Oddbjørn Engvold	Professor	UiO	1	1	1	1	4
Astrid Fossum	PhD Student	NFR	12	10	10	–	32
Boris Gudiksen	Post Doc	NFR	–	6	10	10	26
Viggo Hansteen	Professor	UiO	6	6	6	6	24
Øystein Langangen	PhD student	UiO	–	–	–	9	9
Andrew McMurry	Post Doc	NSF	11	–	–	–	11
Michiel van Noort	Post Doc	NFR	12	10	10	–	32
Luc Rouppe van der Voort	Post Doc	ESMN/UiO	8	12	12[a]	12[b]	44
Saadatnejad Bard	PhD Student	UiO/NFR	12	10	–	–	22
10			70	63	58	47	238

NFR = Norsk Forskningsråd
NSF = National Science Foundation
[a] 10 months on ESMN funding, 2 months on UiO funding
[b] Non-ESMN funding (UiO and other)

KVA (Stockholm)

Name	Position	Funding	Year 1	Year 2	Year 3	Year 4	Total
Peter Dettori	Science Engineer	KVA	10	10	10	7	37
Michiel van Noort	Post Doc	KVA	–	–	–	6	6
Michiel van Noort	Science Engineer	KVA	–	–	–	4	4
Boris Gudiksen	PhD student	KVA	10	4	–	–	14
Tomas Hillberg	PhD student	KVA/SU	–	–	10	10	20
Dan Kiselman	Research Associate	KVA	6	6	4	6	22
Kai Langhans	Post Doc	ESMN	5	10.5[a,b]	8[a]	7.5[a]	31
Mats Löfdahl	Research Associate	KVA	5	5	5	5	20
Gautam Narayan	PhD student	KVA/SU	–	4	10	10	24
Göran Scharmer	Professor	KVA	8	8	8	8	32
10			44	47.5	55	63.5	210

SU: Stockholm University
[a] Interrupted by paternity leave (twins!), mandatory for all KVA personnel.
[b] This number was rounded to 10 months in the second Periodic Report. It is corrected here.

AIP (Potsdam)

Name	Position	Funding	Year 1	Year 2	Year 3	Year 4	Total
Kurt Arlt	Computer Engineer	AIP	–	3	3	4	10
Horst Balthasar	Scientist	AIP	8	8	9	9	34
Thorsten Carroll	Post Doc	AIP/DFG	–	4	6	5	15
Peter Gömöry	PhD-stud./Post Doc[a]	ESMN	–	–	–	6	6
Axel Hofmann	Scientist	AIP	7	6	7	8	28
Bernhard Kliem	Scientist	DFG	–	–	3	3	6
Emil Popow	Scientist/Engineer	AIP	–	2	2	3	7
Jürgen Rendtel	Scient. Assistant	AIP	4	4	4	5	17
Monica Sánchez Cuberes	Post Doc	ESMN	6	12	12	–	30
Jürgen Staude	Professor/Emeritus	AIP	3	4	5	3	15
Gherardo Valori	Post Doc	DFG/AIP	–	4	1	3	8
11			28	47	52	49	176

DFG = Deutsche Forschungsgemeinschaft
[a] Peter Gömöry obtained his PhD in September 2006 while ESMN Fellow

OP (Paris)

Name	Position	Funding	Year 1	Year 2	Year 3	Year 4	Total
Guillaume Aulanier	Scientist	OP	5	5	5	10	25
Arkadiusz Berlicki	Post Doc	ESMN	9	12	11	–	32
Veronique Bommier	Scientist	CNRS	3	2	2	5	12
Pascal Démoulin	Scientist	OP	3	4	–	4	11
Jaroslav Dudík	PhD student	ESMN	–	–	–	2	2
Jean Claude Hénoux	Senior Scientist	retired	3	1	2	-	6
Jean Marie Malherbe	Senior Scientist	OP	6	5	2	2	15
Nicole Mein	Senior Scientist	Paris VII	5	4	5	6	20
Pierre Mein	Senior scientist	retired	5	4	5	6	20
Etienne Pariat	PhD student	EN Lyon	2	2	2	6	12
Brigitte Schmieder	Senior Scientist	OP	10	11	11	11	43
Lidia van Driel-Gesztelyi	Senior Scientist	UCL (UK)	1	5	–	4	10
Nicole Vilmer	Senior scientist	CNRS	4	4	2	–	10
13			56	59	47	56	218

CNRS: Centre National de la Recherche Scientifique
Paris VII: Université Paris VII
EN Lyon: Ecole Normale supérieure de Lyon
UCL: University College London

ESA (Noordwijk/Greenbelt)

Name	Position	Funding	Year 1	Year 2	Year 3	Year 4	Total
Danielle Bewsher	ESA Research Fellow	ESA	9	10	2	–	21
Paal Brekke	Scientist	ESA	2	2	–	–	4
George Dimitoglou	Computer Scientist	ESA	2	–	2	2	6
Bernhard Fleck	Scientist	ESA	3	3	3	3	12
Bernard Foing	Scientist	ESA	1	1	1	–	3
Stein Haugan	Scientist	ESA	4	4	4	1	13
Scott McIntosh	ESA Research Fellow	ESA	4	–	–	–	4
Daniel Müller	Scientist	ESA	–	–	1	4	5
Stéphane Régnier	Post Doc	ESMN	–	9	12	1	22[a]
Luis Sanchez	Scientist	ESA	2	2	2	2	8
Tero Siili	Scientist	ESA	–	–	–	2	2
11			27	31	27	15	100

Most of the ESA team resides at the SOHO Experimenters Operations Facility at the Goddard Space Flight Center.
[a] Stephane Régnier left earlier than anticipated due to an attractive offer. The remaining ESMN allocation to ESA was redistributed over the network through formal agreements (see text).

AsU (Ondřejov)

Name	Position	Funding	Year 1	Year 2	Year 3	Year 4	Total
Pavel Ambrož	Senior Scientist	AsU	5	5	5	2	17
František Fárník	Senior Scientist	AsU	–	–	–	3	3
Stanislav Gunár	PhD student	AsU	–	–	4	4	8
Petr Heinzel	Senior Scientist	AsU	4.5	4.5	4.5	5	18.5
Jan Jurčák	PhD Student	AsU	3	3	3	5	14
Marian Karlický	Senior Scientist	AsU	2	3	3	4.5	12.5
Jana Kašparová	Post Doc	AsU	3	3	3	5	14
Miroslav Klvaňa	Senior Scientist	AsU	5	5	5	3	18
Pavel Kotrč	Senior Scientist	AsU	5	5	5	5	20
Pavol Schwartz	Post Doc	AsU	–	4	4	5	13
Michal Sobotka	Senior Scientist	AsU	5	5	5	5	20
11			32.5	37.5	41.5	46.5	158

AISAS (Tatranská Lomnica)

Name	Position	Funding	Year 1	Year 2	Year 3	Year 4	Total
Katarína Brčeková	PhD Student	AISAS	8	3	–	–	11
Peter Gömöry	PhD Student	AISAS	6	8	8[a]	5[c]	27
Július Koza	Scientist	AISAS	8	9	8[b]	1[d]	26
Aleš Kučera	Senior Scientist	AISAS	4	3	4	4	15
Ján Rybák	Senior Scientist	AISAS	4	4	4	4	16
Július Sýkora	Senior Scientist	AISAS	3	3	3	3	12
František Tomasz	PhD Student	AISAS	6	8	8	7	29
7			39	38	35	24	136

[a] Seconded during 10 months to UU on EC-MC funding
[b] Seconded to UU from July 1, 2005 on EC-EIF funding
[c] Seconded during 6 months to AIP on on ESMN funding
[d] Seconded to UU on EC-EIF funding

ELTE (Budapest)

Name	Position	Funding	Year 1	Year 2	Year 3	Total	
Balazs Major	PhD Student	ELTE	6	12	12	–	30
Kristof Petrovay	Assoc. Prof.	ELTE	5	7	6	6	24
Emese Forgacs-Dajka	Assist. Prof.	ELTE	6	6	6	6	24
Gábor Marschalkó	PhD student	ELTE	–	–	4	9	13
Dániel Marik	PhD student	ELTE	5	–	–	–	5
Ágnes Kóspál	PhD student	ELTE	–	2	–	–	2
6			22	27	28	21	98

Overall assessment of the ESMN research achievements: the network has been extremely productive and has achieved important progress in a large range of solar physics research topics and techniques. There are now over 250 acknowledgements to the ESMN in papers from the ESMN-2 period (exceeding the number of references on pp. 39 ff because the latter do not include single-partner papers unless authored by a Fellow or an Associated-State team member). They will remain a lasting tribute to this network in the solar physics literature even though, unfortunately, its existence now terminates.

B.2 Organisation and Management

The ESMN *organisation, coordination and management* adhered fully to the practices specified in Section B.4 of Annex I of the contract. The *communication strategy* was to do all administration, coordination and reporting per email and through non-public web access to pertinent directories and files. Indeed, all management including the selection and hiring of ESMN Fellows went fully by email. As planned, Ing. Pieter Thijssen of the UU Finance Department controlled the financial administration – with great efficiency and expertise: the ESMN owes him a much larger debt than the small farewell present he received as token of gratitude during the ESMN Conclusion Ceremony at the Coimbra ESMN Conclusion Conference. The ESMN planning meetings indeed took mostly place during international conferences and ESMN observing campaigns, as evident from the yearly tabulations (given below for the final year).

The *result dissemination* was indeed primarily through publications in the major refereed international journals and in conference proceedings, as planned and documented by the complete ESMN publication list below. The travel lists (below for Year 4, for the preceding years in the preceding reports) specify at which conferences and workshops the ESMN Fellows and Associated-State members have represented and presented the ESMN. As mentioned above, the ESMN coordinator presently co-edits the proceedings of the Coimbra ESMN Conclusion Conference.

As to *non-EU travel*, also during the fourth year no ESMN fellow has travelled to ESA's experimenters facility at the Goddard Space Flight Center, USA, which was explicitly deemed

approved in the Contract and was seen as a desirable training element for ESMN Fellows but became impractical if not impossible after 9/11. Nor has prior approval been sought to fund other outside-EU travel since it was the ESMN's policy to use non-ESMN funding for all such travel.

Budget redistribution: as announced already in last year's ESMN report, ESA Fellow Stéphane Régnier left the ESMN earlier than intended upon receiving an attractive offer from the University of St Andrews. Although replacement candidates were initially sought, it was later decided to revert these months (*i.e.*, their funding) to other partners. A major motivation was the same obstacle that impeded the originally intended ESMN traineeships at the SOHO EOF at Goddard: it is nearly impossible to gain bodily access there for Europeans in the 9/11 aftermath. Although ESA Fellows reside at Noordwijk, most of the ESA team including the ESA Scientist-in-Charge is located at Goddard so that at least one Fellow visit there would have been highly desirable if not essential. Therefore, after consultation with the Project Officer, and established through appropriate written and signed agreements between the ESMN Coordinator and the pertinent ESMN partners, the ESMN redistributed the corresponding left-over ESA funding allocation over some other partners for Fellow hiring (Berlicki at UU, Dudík at OP, Langhans extension at KVA) while the remainder permitted the ESMN to evolve the Coimbra meeting into being the ESMN Conclusion Conference by contributing to its organisation and proceedings costs.

ESMN schools: the three ESMN schools were reported in detail in the previous reports.

ESMN conferences: the ESMN Conclusion Conference is detailed as Year-4 highlight at the start of this report. It wasn't foreseen in the contract but turned out a very good idea. In fact, the Project Officer had indeed suggested, when concluding the Mid-Term Review, that the ESMN organise such a wrap-up meeting presenting its achievements to the wider community, but at that time it wasn't clear that the budget would allow such activity. (Perhaps the ESMN should be grateful to Stéphane Régnier for leaving prematurely.)

ESMN meetings: the ESMN had the standard policy to let collaboration planning take place at the international conferences and workshops to which ESMN members travelled anyhow, and during the many ESMN observing campaigns. This proved to be a sound, efficient, and successful strategy. In addition, many ESMN discussions took place during bilateral visits that are not and have not been specified in our reports because most of these were not ESMN-funded. However, ESMN-related partner visits by Fellows and Associated-State partners are specified in their yearly travel lists. The overall ESMN "traffic" is summarised in the yearly networking tables.

ESMN travels: the travels lists below and in the preceding reports specify travels of ESMN nature. It is impractical to tabulate all pertinent travels of all ESMN team members, and that would represent unjust overclaim of the ESMN's role for the many travels not funded by ESMN. For example, the IAC served as a hub in the ESMN because many ESMN members visited there prior or after observing with a Canary Island telescope, or met at these telescopes themselves. Although often ESMN science and organisation were discussed during such encounters, they cannot be listed as ESMN-supported nor claimed as EC "product". As in our earlier reports, the travels lists below are therefore restricted to ESMN Fellows during their ESMN tenure (but then include also their travels on other funding, for the sake of completeness in demonstrating their integration in European solar physics) and to ESMN-funded as well as non-ESMN-funded but

ESMN-related travels of Associated-State team members (where all ESMN funding supported such travel).

ESMN activity matrix: the Year-4 networking table at the end of this section again summarises all ESMN traffic irrespective of its source of funding.

West-East considerations: a principal difference between ESMN-1 and ESMN-2 has been the EU's opening up to and later extension with Eastern European countries, still termed "Associated States" under FP5. When the ESMN proposed ESMN-2 we added three Associated-State partners groups but did not dare to include EC-funded postdocs at their institutes in fear of weakening our proposal for various reasons, one of them the issue of recruiting success. The addition has been gratifying. As reported above, the AsU director was the chair and principal organiser of the ESMN Conclusion Conference at Coimbra. Partner AISAS became much involved in Canary Island observing and spreading their young researchers to the West: the AISAS Scientist-in-Charge has frequently commented that membership of the ESMN has been a great boon to his group even though all they got was modest travel support (but they also got the ESMN Mid-Term Review on their premises, with superb local organisation). Partner ELTE turned out the least ESMN-integrated one, as is clear from the networking matrix below, but will suit much better within the upcoming SOLAIRE network (see below) which puts more emphasis on theoretical modeling of the solar interior than the ESMN did.

Future endeavours: at present the SOLAIRE Network for FP6 is in contract negotiation for funding by the EC. This new FP6 network encompasses five ESMN partners (IAC, UU, UiO, OP, ELTE) and will so effectuate a partial continuation of the ESMN. Another partial continuation is the UU-KVA-UiO "Utrecht-Stockholm-Oslo Graduate School in Solar Physics" funded through the EC's EST programme, which, like their formally established USO collaboration, is a direct offspring of the ESMN. The USO Graduate School started up during the report year by hiring graduate students (three coming from the IAC) as well as shorter-term trainees, and with an introductory school led by the ESMN coordinator at the SST and the DOT on La Palma.

In the remainder of this section we provide the Year-4 campaigns, meetings, and travels lists and networking matrix in the same format as in the preceding three reports. The similar tables in these older reports are not repeated here, to avoid duplicity. The total number of ESMN observing campaigns amounts to 59, many more than was anticipated in the contract.

Collaborative ESMN observing campaigns during the final ESMN year

1. "Chromospheric loops", March 23-26, DOT, SOHO, partners IAC, UU
2. "Spectroscopy and imaging tomography of solar fibrils: photospheric drivers and coronal consequences", April 11–26 2006, SST, DOT, SOHO, TRACE, partners AISAS, KVA, UU, ESA
3. "Spectroscopy of chromospheric dynamics", April 27 – May 10 2006, SST, DOT, partners UiO, UU
4. "The magnetic field and electric current densities in sunspots and active regions", May 19 – June 2 2006, VTT, THEMIS, SOHO, TRACE, partners AIP, OP, IAC
5. "Vector Magnetic Field Maps of Active Regions", May 20 – June 3 2006, THEMIS, partners

OP, AIP, IAC, OAA

6. “3D geometry of chromospheric magnetic fields”, May 31 - June 6 2006, VTT, partners IAC, OAA
7. “Second Solar Spectrum in and off the solar limb”, June 3–6 2006, THEMIS, partners OP, OAA, IAC
8. “Faculae”, June 3–9 2006, SST, DOT, TRACE, SOHO, partners KVA, UU (PI Berger, Lockheed-Martin, USA)
9. “Imaging of the quiet Sun chromosphere at high cadence”, June 10–22 2006, SST, TRACE, partners UiO, KVA
10. “Scattering polarization in the D2 line of Ba II”, Jun 25 – Jul 10 2006, IRSOL (Locarno), partners OAA, IAC
11. “Photospheric drivers of physical mechanisms responsible for the energy transport and dynamics in/above chromospheric network”, June 28 – July 12 2006, DOT, SOHO, TRACE, partners AISAS, UU, ESA
12. “High-resolution study of solar microflares and their relevance for coronal heating and mass suppl”, June 28 – July 12 2006, DOT, SOHO, TRACE, RHESSI, Kanzelhöhe Solar Observatory, partners AISAS, UU, ESA
13. “Ba II 4554 Å polarimetry”, August 20–29 2006, SST, DOT, partners KVA, UU
14. “Filaments and the filament environment”, August 25–31, 2006, THEMIS, SOHO, TRACE, Hida Observatory (Japan), Ondřejov Observatory (AsU), partners AsU, ESA, OP
15. “Emerging flux and active regions”, September 1–3, 2006, THEMIS, SOHO, TRACE, Hida Observatory (Japan), Ondřejov Observatory (AsU), partners AsU, ESA, OP
16. “Imaging of active region filaments at high candence”, September 14–26 2006, SST, DOT, TRACE, partners UiO, UU, KVA
17. “Spicules”, September 27 – October 6 2006, SST, DOT, TRACE, SOHO, partners KVA, UU (PI De Pontieu, Lockheed-Martin)

ESMN planning meetings during the final ESMN year

1. Workshop “Eighth MHD Days”, Potsdam, Germany, November 28–29 2005, partners AIP, ELTE
2. General European Assembly, International Heliophysical Year, Paris, France, January 8–13 2006, all partners
3. GREGOR project meeting, Göttingen, Germany, March 16–17 2006, partners AIP, AsU, IAC
4. Exploratory Workshop ESF: “New Generation Large Aperture Solar Telescopes”, Monteporzio Catone, Italy, April 9–13 2006, partners OAA, UiO, UU, KVA, AsU, OP, IAC
5. Workshop: “TRIPPEL at the SST”, Stockholm April 10, 2006, partners KVA, AISAS
6. Solar-B SOT meeting, Tokyo, Japan, April 15–20, 2006, partners KVA, UiO, UU

7. Solar Orbiter Meeting, Lindau, Germany, May 3–5 2006, partners KVA, UiO, IAC
8. Conference “SOHO-17: 10 Years of SOHO and Beyond”, Giardini Naxos, Italy, May 7–12 2006, partners OAA, AISAS, AsU, ESA, AIP, UU, ELTE, OP
9. Workshop “MHD Waves and oscillations in solar magnetic structures”, Palma de Mallorca, Spain, May 29 – June 1 2006, partners OAA, UU, ESA, UiO
10. Founding Meeting of the European Association for Solar Telescopes: “Towards the European Solar Telescope”, Freiburg, Germany, June 12–14 2006, partners UU, IAC, OAA, UiO, KVA, AsU, AISAS
11. Solar Physics Division Meeting, American Astronomical Society, Durham (NH, USA), June 25–30 2006, partners OAA, ESA
12. XXIVth General Assembly International Astronomical Union, Prague, Czech Republic, August 14–25 2006, all partners
13. Workshop “Solar Flares and Initialisation of CMEs”, Tatranská Lomnica, Slovakia, September 13–15 2006, partners AIP, AISAS, ASU
14. VIIIth Hvar Astrophysical Colloquium “Dynamical Processes in the Solar Atmosphere”, Hvar, Croatia, September 24–29 2006, partners AISAS, AIP, AsU
15. SST–EST planning meeting, September 25–27 2006, IAC La Laguna, partners IAC, KVA
16. Workshop “Modern Solar Facilities - Advanced Solar Science”, Göttingen, Germany, September 27–29 2006, partners AIP, UU, KVA, AsU, ESA, AISAS, IAC, AIP, OAA
17. ESMN Conclusion Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13 2006, all partners
18. “Second Solar Orbiter Workshop”, Athens, Greece, October 16–20 2006, partners IAC, ESA
19. Meeting Science Working Group, Advanced Technology Solar Telescope project, Hawaii, October 16–19 2006, partners UiO, OAA, IAC

ESMN travels during the final ESMN year

Arkadiusz Berlicki (ESMN Fellow at UU September 1 – October 31, 2006)

- USO School “Solar data analysis”, La Palma, Spain, September 22–29, 2006
- ESMN Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13, 2006
- Collaborative visit to Partner OP, Meudon, France, October 15–19, 2006

Laura Merenda (ESMN Fellow at IAC March 1, 2003 – October 31, 2006)

- Observing campaign at VTT, June 6 - 11, 2006
- ESMN Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13, 2006

Moncef Derouich (ESMN Fellow at IAC July 1, 2005 – October 31, 2006)

- Collaborative visit to Partner OP, Meudon, France, April 8 - May 11, 2006
- Observing campaign at THEMIS, August 5–10, 2006
- Observing campaign at THEMIS, October 16–20, 2006

Peter Gömöry (ESMN Fellow at AIP May 1, 2006 – October 31, 2006)

- Observing campaign at VTT, May 17 – June 3, 2006
- ESMN Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13, 2006
- Workshop “Modern Solar Facilities – Advanced Solar Science” Göttingen, Germany, September 26–29, 2006
- Collaborative visit to Partner AISAS, Tatranská Lomnica, Slovakia, September 8–19, 2006

Pavel Ambrož (AsU staff)

- Collaborative visit to Partner OP, Meudon, France, September 4–17 2006
- Collaborative visit to Partner AISAS, Tatranská Lomnica, Slovakia, June 4–18 2006

František Fárník (AsU staff)

- RHESSI Workshop, Meudon, France, April 4–8 2006

Stanislav Gunár (AsU PhD student)

- ESMN Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13, 2006

Petr Heinzel (AsU staff)

- ESMN Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13, 2006

Marian Karlický (AsU staff)

- Collaborative visit to Partner AISAS Tatranská Lomnica, Slovakia, September 9–16 2006

Jana Kašparová (AsU postdoc)

- ESMN Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13, 2006

Pavel Kotrč (AsU staff)

- Collaborative visit to Partner AISAS, Tatranská Lomnica, Slovakia, September 9–16 2006
- ESMN Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13, 2006

Pavol Schwartz (AsU postdoc)

- ESMN Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13, 2006

Michal Sobotka (AsU staff)

- Collaborative visit to Partner IAC, La Laguna, Spain, November 5–19 2006
- ESMN Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13, 2006

Aleš Kučera (AISAS staff)

- Collaborative visit to Partner UU, February 26 – March 4, 2006
- Observing campaign at SST and DOT, April 11–24, 2006
- Conference “SOHO-17: 10 Years of SOHO and Beyond”, Giardini Naxos, Italy, May 7–12, 2006
- “VIIIth Hvar Astrophysical Colloquium: Dynamical Processes in the Solar Atmosphere”, Hvar, Croatia, September 24–29, 2006

Ján Rybák (AISAS staff)

- Observing campaign at SST and DOT, April 11–24, 2006

Július Koza (AISAS staff, UU MC-EIF Fellow)

- Observing campaign at SST and DOT, April 11–24, 2006
- Conference ”Modern Solar Facilities - Advanced Solar Science”, Göttingen, Germany, September 26–29, 2006
- ESMN Conference “The Physics of Chromospheric Plasmas”, Coimbra, Portugal, October 9–13, 2006

František Tomasz (AISAS PhD student)

- Collaborative visit to Partner AsU, Ondřejov, Czech Republic, June 19–23, 2006

Emese Forgács-Dajka (ELTE staff)

- Meeting "MHD Days 2005", AIP, Potsdam, Germany, November 28–29, 2005
- Conference "SOHO-17: 10 Years of SOHO and Beyond", Giardini Naxos, Italy, May 7–12, 2006
- IAU General Assembly, Prague, Czech Republic, August 2006

Gábor Marschalkó (ELTE PhD student)

- Meeting "MHD Days 2005", AIP, Potsdam, Germany, November 28–29, 2005
- IAU General Assembly, Prague, Czech Republic, August 2006

Kristóf Petrovay (ELTE staff)

- Conference "SOHO-17: 10 Years of SOHO and Beyond", Giardini Naxos, Italy, May 7–12, 2006

ESMN networking matrix

The *networking table* below displays the intensity matrix of interactions between ESMN partners during the report year, with as scale 0 = no collaboration, 1 = some collaboration, 2 = much collaboration, 3 = intense collaboration. The estimates include both ESMN-funded travel (primarily by ESMN Fellows and young Associated-State team members) and networking funded from other sources.

Team	UU	IAC	OAA	UiO	KVA	AIP	OP	ESA	AsU	AISAS	ELTE
UU	–	1	2	3	3	1	2	0	2	3	0
IAC	1	–	3	2	3	2	2	1	3	1	0
OAA	2	3	–	3	1	1	3	0	1	2	0
UiO	3	2	3	–	3	0	2	3	0	2	0
KVA	3	3	1	3	–	1	0	1	1	1	0
AIP	1	2	1	0	1	–	2	1	2	2	1
OP	2	2	3	2	0	2	–	3	3	1	1
ESA	0	1	0	3	1	1	3	–	1	2	1
AsU	2	3	1	0	1	2	3	1	–	3	0
AISAS	3	1	2	2	1	2	1	2	3	–	0
ELTE	0	0	0	0	0	1	1	1	0	0	–

B.3 Training Overview

In its *recruiting* the ESMN had no difficulty at all filling its vacancies (excepting ESA during the final year, for the reason described above). The recruiting took place through web advertisements, electronic newsletter announcements, and personally directed emails; these mechanisms

worked well enough – there was no need to invest in posters or ads in commercial publications. The EC's CORDIS vacancy website generated many more non-applicable applications, in particular from the Near and Far East, than valid ones.

An updated *ESMN recruitment table* is given below. As noted before, the change from the originally envisaged post-doc to pre-doc in the case of Laura Merenda at the IAC was explained in a letter to the Project Officer on March 27, 2003. The change at UiO was conform the original ESMN proposal (the subsequent 6/24 split was entered in the contract to accommodate a specific candidate but turned out unnecessary). The redistribution of ESA's funding for non-used personmonths to other partners has been detailed in Section B.2 above. It resulted in further growth of the total number of ESMN Fellows to twelve and of the total number of Fellow-hiring personmonths to 281 (98 of which womanmonths).

Participant	Contract deliverable of Young Researchers to be financed by the contract (personmonths)			Young Researchers ("Fellows") financed by the contract (personmonths)		
	Pre-doc (a)	Post-doc (b)	Total (a + b)	Pre-doc (c)	Post-doc (d)	Total (c + d)
1. UU	–	30	30	0	32	32
2. IAC	–	30	30	44	16	60
3. OAA	–	30	30	0	36	36
4. UiO	6	24	30	0	30	30
5. KVA	–	30	30	0	31	31
6. AIP	–	30	30	5	31	36
7. OP	–	30	30	2	32	34
8. ESA	–	30	30	0	22	22
9. AsU	–	–	–	–	–	–
10. AISAS	–	–	–	–	–	–
11. ELTE	–	–	–	–	–	–
TOTAL	6	234	240	51	230	281

The ESMN *training programme* followed the element list given in Section B.5 of Appendix I to the contract. Most ESMN Fellows took part in observing with the Canary Island telescopes. However, none has worked at the SOHO EOF at Goddard because such secondments unfortunately became virtually impossible through post-9/11 security restrictions. All ESMN Fellows gained expertise in observing strategies, data reduction, and analysis techniques, and they all participated in local seminars, ESMN schools, and international meetings. The detailed lists above and in the previous reports specify their travels as Fellow. These also specify the international meetings where they represented the ESMN and presented their ESMN research.

The *current whereabouts* of all ESMN Fellows (in partner order) are:

- *Kostas Tziotziou*
  ESMN Fellow at UU March 1 2003 – August 31 2005.
  Present position: Associate researcher, Institute for Space Applications and Remote Sensing, National Observatory of Athens, Greece, including a two-year Marie Curie European Reintegration Grant.
- *Arek Berlicki*
  ESMN Fellow at OP February 1 2003 – September 30 2005;
  ESMN Fellow at UU September 1 2006 – October 31 2006.
  Present position: tenured Astronomer-Lecturer, Astronomical Institute, Wrocław University, Poland
- *Moncef Derouich*
  ESMN Fellow at IAC July 1 2005 – October 31 2006.
  Present position: postdoctoral researcher November 1 – December 31, IAC. Forthcoming position: postdoctoral researcher, Institute for Space Astrophysics (IAS), Paris, Orsay, France.
- *Laura Merenda*
  ESMN Fellow at IAC March 1 2003 – October 31 2006.
  Will complete her PhD thesis at the University of La Laguna around March 2007. She presently commences applying for subsequent postdoctoral positions, in particular at ESMN partners.
- Katja Janssen (ESMN Fellow at OAA September 1 2003 – August 31 2005)
  Present position: postdoctoral researcher, OAA.
- Andrés Asensio Ramos (ESMN Fellow at OAA September 1 2004 – August 31 2005)
  Present position: postdoctoral researcher, IAC.
- Luc Rouppe van der Voort (ESMN Fellow at UiO March 1 2003 – August 31 2005)
  Present position: postdoctoral researcher, UiO.
- Kai Langhans (ESMN Fellow at KVA May 1 2003 – August 15 2006)
  Present position: teacher mathematics and physics, Johanneum High School, Lübeck, Germany.
- Monica Sánchez Cuberes (ESMN Fellow at AIP May 1 2003 – October 31 2005)
  Presently: engaged in a social project in Caracas, Venezuela.
- Peter Gömöry (ESMN Fellow at AIP May 1 2006 – October 31 2006)
  Present position: tenured solar physicist, AISAS.
- Jaroslav Dudík (ESMN Fellow at OP September 1 2006 – October 31 2006)
  Present position: PhD student, Faculty of Mathematics, Physics & Informatics, Comenius University, Bratislava, Slovakia
- Stéphane Régnier (ESMN Fellow at ESA/ESTEC February 1 2004 – November 30 2005)
  Present position: postdoctoral researcher, School of Mathematics and Statistics, University of St Andrews, United Kingdom.

ESMN training has been obviously important for all Fellows. It was a key career step for those who remain in solar physics – all but Monica Sánchez Cuberes whose plans are not yet defined and Kai Langhans who as physics teacher now spreads the message of the fun inherent in research to high-school pupils. No ESMN-2 Fellow brain-drained to the USA (yet). The Associated-State Fellows (Berlicki and Gömöry; the latter obtained his PhD during his stay at AIP) returned as tenured staff to their home institutions enriched with Europe-wide network experience and expertise.

B.4 Industrial connection

None of the ESMN Fellows was trained formally at or by industry, but many were exposed to industrial contacts in the context of their work including telescope instrumentation, advanced CCD camera technology, computer hardware, etc. ESMN papers in which industrial partners, in particular from the Lockheed-Martin company, were involved at the level of co-authorship or principal authorship are specified as such in both ESMN publication lists in this report.

There are no plans to commercialise ESMN science results.

B.5 Recommendations

Although there were a few predocs amongst the ESMN Fellows, the ESMN appreciated the emphasis on postdoc hiring of the FP4 and FP5 programmes. Ongoing experience with the shifted FP6 emphasis on predoc training indicates that recruiting abroad with candidate quality and promise as key selection considerations is much harder for such just-graduated candidates without the research experience nor recommendatory supervisor insight that are gained in PhD thesis research. The fine-comb practice of subjecting candidates to comprehensive physics examinations and in-depth interviews through which the better US graduate schools select their candidates suggest a way to go if Europe desires to combine migrating graduate students across the continent with raising overall quality in response to the needs of the knowledge economy. The US does not only spend much more on higher education and research than Europe but also has much better mechanisms to migrate the best students to the best universities. Re migration itself the obvious political choice for “the younger the better” in turning the next generation into widely travelled Europeans is easily made, but re quality, graduate-study research maturity and demonstration of it remains an important pruning asset.

Another matter of serious concern is scale of operation. The FP4 to FP6 networks typically targeted a dozen research teams; the imposed financial constraints did not permit significantly smaller or larger proposal constructions with reasonable chance of success. The actual extent of our field in terms of “European research area” is about 40 teams, each characteristically made up by 2-6 tenured researchers located at or near a university, a pure-research institution (such as OP, AsU, AISAS), or a European institution (such as ESA). Ours is a relatively small field, but the ESMN, in both its incarnations, covered only a quarter or less of it. In both ESMN proposal stages potential partner candidates of high standing were dropped for purely political reasons. Thus, the ESMN was too small. The same will hold for SOLAIRE the coming years. However, in FP7 the EC targets much larger-scale organisations (“ASTRONET”) than the size of our complete field. Thus, our research area was effectively too large for FP4 through FP6 but will be too small for FP7. Our recommendation is that the EC should be aware that not all the

fish it wants to hatch or catch is of a single measure.

Finally, solar physics may be in its golden age worldwide, but it remains seriously and dangerously underfunded in Europe. (In the USA the recognition that space weather affects the economy significantly has led to a significant increase of solar physics funding.) Even within the already-too-small ESMN setup, the underfunding of our research was illustrated by the too-short Fellow contract durations (half a year less than in ESMN-1) and by the ease in which the ESMN hired its Fellows. The supply was significantly larger than the rather limited ESMN constraint of only 30 personmonths of postdoc hiring per partner. Both the ESMN training capacity and the number of qualified young researchers seeking such training exceeded the funded volume. ESMN could and should have trained more youngsters, and longer. Not all of them would end up as solar physicists, but all would have become highly computer-literate problem solvers used to cut through complexities to arrive at working solutions, a boon to society. The underfunding of our field implies unnecessary loss of valuable potentiality towards the knowledge economy.

Part C – Reports and Questionnaires

The "Young Researcher" summary reports (Annex A) of the ESMN Fellows listed below are enclosed with this report. Note that Stéphane Régnier left the ESMN by November 30, 2005 so that his report should formally have been included with this final report, but since there was enough time between his departure and last year's submission of the third-year report, it was included then already.

- Arkadiusz Berlicki (ESMN Fellow at UU September 1, 2006 - October 31, 2006)
- Laura Merenda (ESMN Fellow at IAC March 1, 2003 – October 31, 2006)
- Moncef Derouich (ESMN Fellow at IAC July 1, 2005 – October 31, 2006)
- Kai Langhans (ESMN Fellow at KVA June 1, 2003 – August 15, 2006, with gaps)
- Peter Gömöry (ESMN Fellow at AIP May 1, 2006 – October 31, 2006)
- Jaroslav Dudík (ESMN Fellow at OP September 1, 2006 - October 31, 2006)

In addition, we enclose the requested eleven "Coordinators and Scientists-in-Charge Questionnaires" (Annex C) with this report.

All ESMN papers

[1] Asensio Ramos, A., Janssen, K., Cauzzi, G., and Reardon, K.: 2006, "High-resolution IBIS Observations and Comparison with 3D Simulations", *Memorie della Societa Astronomica Italiana Supplement* **9**, 59
- *Asensio Ramos, Janssen: OAA Fellows; Cauzzi, Reardon: OAA*
- *Objectives (a), (f)*

[2] Asensio Ramos, A., Landi Degl'Innocenti, E., and Trujillo Bueno, J.: 2005a, "Dichroic Masers Due to Radiation Anisotropy and the Influence of the Hanle Effect on the Circumstellar SiO Polarization", *Astrophysical Journal* **625**, 985–995
- *Asensio Ramos: OAA Fellow; Landi Degl'Innocenti: OAA Trujillo Bueno: IAC*
- *Objectives (f)*

[3] Asensio Ramos, A. and Socas-Navarro, H.: 2005, "An artificial neural network approach to the solution of molecular chemical equilibrium", *Astronomy & Astrophysics* **438**, 1021–1028
- *Asensio Ramos: OAA Fellow*
- *Objectives (d), (f)*

[4] Asensio Ramos, A. and Trujillo Bueno, J.: 2006, "Very Efficient Methods for Multilevel Radiative Transfer in Atomic and Molecular Lines", in P. Stee (Ed.), *EAS Publications Series*, 25–48
- *Asensio Ramos: OAA Fellow & IAC; Trujillo Bueno: IAC*
- *Objective (f)*

[5] Asensio Ramos, A., Trujillo Bueno, J., Carlsson, M., and Cernicharo, J.: 2003, "Nonequilibrium CO Chemistry in the Solar Atmosphere", *Astrophysical Journal Letters* **588**, L61–L64
- *Asensio Ramos: IAC; Trujillo Bueno: IAC; Carlsson: UiO*
- *Objectives (f)*

[6] Asensio Ramos, A., Trujillo Bueno, J., and Collados, M.: 2005b, "Observation and Modeling of Anomalous CN Polarization Profiles Produced by the Molecular Paschen-Back Effect in Sunspots", *Astrophysical Journal Letters* **623**, L57–L61
- *Asensio Ramos: OAA Fellow; Trujillo Bueno: IAC Collados: IAC*
- *Objectives (a), (b)*

[7] Ataç, T., Özgüç, A., and Rybák, J.: 2005, "Intermediate-Term Periodicities in Some Solar Activity Indices during Cycle 23", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 151–154
- *Rybák: AISAS*
- *Objective (b)*

[8] Ataç, T., Özgüç, A., and Rybák, J.: 2006, "Periodicities in Irradiance and in other Solar Activity Indices During Cycle 23", *Solar Physics* **237**, 433–444
- *Rybák: AISAS*
- *Objective (b)*

[9] Ataç, T., Özgüç, A., and Rybák, J.: 2005, "Overview of the flare index during the maximum phase of the solar cycle 23", *Advances in Space Research* **35**, 400–405
- *Rybák: AISAS*
- *Objective (b)*

[10] Badalyan, O., Obridko, V., Rybak, J., and Sykora, J.: 2003, "N-S Asymmetry of Solar Activity and Quasi-biennial Oscillations", in *Solar Variability as an Input to the Earth's Environment*, Procs. of ISCS 2003 Symposium, ESA SP-535, ESA Publ. Div., ESTEC, Noordwijk, 63–66
- *Rybak, Sykora: AISAS*
- *Objective (c)*

[11] Badalyan, O. G., Obridko, V. N., Rybak, J., and Sýkora, J.: 2005, "Quasibiennial Oscillations of the North-South Asymmetry", *Astronomy Reports* **49**, 659–670
- *Rybák: AISAS*
- *Objective (b)*

[12] Badalyan, O. G., Obridko, V. N., and Sýkora, J.: 2005a, "Quasi-Biennial Oscillations in the N-S Asymmetry of Solar Activity", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 152–155
• *Sýkora: AISAS*
• *Objective (b)*

[13] Badalyan, O. G., Obridko, V. N., and Sýkora, J.: 2005b, "Temporal Variations of the Solar Corona Rotation", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 50–53
• *Sýkora: AISAS*
• *Objective (b)*

[14] Balthasar, H., Bellot Rubio, L., and Collados, M.: 2003, "The Structure of the Penumbra", *Astronomische Nachrichten* **324**, 390–390
• *Balthasar: AIP; Collados: IAC*
• *Objectives (a), (f)*

[15] Balthasar, H. and Bommier, V.: 2007, "Simultaneous Polarimetric Observations with VTT and THEMIS", in F. Kneer, K. G. Puschmann, and A. D. Wittmann (Eds.), *Modern Solar Facilities – Advanced Solar Science*, Universitätsverlag Göttingen, in press
• *Balthasar: AIP; Bommier: OP;*
• *Objectives (a), (b), (c), (e), (f)*

[16] Balthasar, H. and Collados, M.: 2005, "Some properties of an isolated sunspot", *Astronomy & Astrophysics* **429**, 705–711
• *Balthasar: AIP; Collados: IAC*
• *Objectives (b), (f)*

[17] Balthasar, H., von der Lühe, O., Kneer, F., Staude, J., Volkmer, R., Berkefeld, T., Caligari, P., Collados, M., Halbgewachs, C., Heidecke, F., Hofmann, A., Klvaňa, M., Nicklas, H., Popow, E., Puschmann, K., Schmidt, W., Sobotka, M., Soltau, D., , Strassmeier, K., and Wittmann, A.: 2007, "GREGOR - the New German Solar Telescope", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Balthasar, Hofmann, Popow, Staude: AIP; Sobotka, Klvaňa: AsU; Collados: IAC;*
• *Objective (d)*

[18] Bellot Rubio, L., Balthasar, H., Collados, M., and Schlichenmaier, R.: 2003, "Field-aligned Evershed flows in the photosphere of a sunspot penumbra", *Astronomy and Astrophysics* **403**, L47–L50
• *Balthasar: AIP; Collados: IAC*
• *Objectives (a), (f)*

[19] Bellot Rubio, L. R., Balthasar, H., and Collados, M.: 2004, "Two magnetic components in sunspot penumbrae", *Astronomy & Astrophysics* **427**, 319–334
• *Balthasar: AIP; Collados: IAC*
• *Objectives (b), (f)*

[20] Bellot Rubio, L. R., Langhans, K., and Schlichenmaier, R.: 2005, "Multi-line spectroscopy of dark-cored penumbral filaments", *Astronomy & Astrophysics* **443**, L7–L10
• *Kai Langhans: KVA Fellow*
• *Objectives (a), (d)*

[21] Belluzzi, L., , Landi Degl'Innocenti, E., and Trujillo Bueno, J.: 2007a, "Theoretical Investigation of the Polarization Properties of the D_2 Lines of Alkali Atoms", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Belluzzi, Landi Degl'Innocenti: OAA; Trujillo Bueno: IAC*
• *Objectives (f)*

[22] Belluzzi, L., Trujillo Bueno, J., and Landi Degl'Innocenti, E.: 2007b, "The Hanle and Zeeman Effects in the Ba II D_2 Line", in R. Casini and B. W. Lites (Eds.), *Solar Polarization 4*, Astronomical Society Pacific

Conference Series, in press
• *Belluzzi, Trujillo Bueno: IAC; Landi Degl'Innocenti: OAA,*
• *Objective (f)*

[23] Berger, T. E., Rouppe van der Voort, L., and Löfdahl, M.: 2007, "Contrast analysis of solar faculae and magnetic bright points", *Astrophysical Journal* , submitted
• *Rouppe van der Voort: UiO Fellow; Löfdahl: KVA*
• *Objectives (a), (b), (f); collaboration with industry*

[24] Berger, T. E., Rouppe van der Voort, L. H. M., Löfdahl, M. G., Carlsson, M., Fossum, A., Hansteen, V. H., Marthinussen, E., Title, A., and Scharmer, G.: 2004, "Solar magnetic elements at 0.1 arcsec resolution. General appearance and magnetic structure", *Astronomy & Astrophysics* **428**, 613–628
• *Rouppe van der Voort: UiO Fellow; Hansteen, Carlsson, Fossum, Marthinussen, van Noort: UiO; Löfdahl, Scharmer: KVA*
• *Objectives (a), (b), (c), (e); collaboration with industry*

[25] Berlicki, A.: 2007, "Observations and modelling of line asymmetries in chromospheric flares", in P. Heinzel, I. Dorotovic, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Berlicki: UU fellow*
• *Objectives (b), (f)*

[26] Berlicki, A. and Heinzel, P.: 2004, "Soft X-ray heating of the solar chromosphere during the gradual phase of two solar flares", *Astronomy & Astrophysics* **420**, 319–331
• *Berlicki: OP Fellow; Heinzel: AsU*
• *Objectives (b), (e), (f)*

[27] Berlicki, A., Heinzel, P., Schmieder, B., Mein, P., and Mein, N.: 2005a, "Non-LTE diagnostics of velocity fields during the gradual phase of a solar flare", *Astronomy & Astrophysics* **430**, 679–689
• *Berlicki: OP Fellow; Heinzel: AsU; Schmieder: OP & UiO; Mein, Mein: OP*
• *Objectives (b), (f)*

[28] Berlicki, A., Mein, P., and Schmieder, B.: 2005b, "Active Region Magnetic Field Observed with THEMIS/MSDP and SOHO/MDI Instruments", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 57
• *Berlicki: OP & UU Fellow; Mein, Schmieder: OP*
• *Objectives (a), (b), (d)*

[29] Berlicki, A., Mein, P., and Schmieder, B.: 2006, "THEMIS/MSDP magnetic field measurements", *Astronomy & Astrophysics* **445**, 1127–1132
• *Berlicki: OP & UU Fellow; Mein, Schmieder: OP*
• *Objectives (a), (b), (d), (f)*

[30] Berlicki, A., Schmieder, B., Heinzel, P., Li, H., Del Zanna, G., and Rudawy, P.: 2005c, "Multi-Wavelength Analysis of Plasma Flows during Solar Flares", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 58
• *Berlicki: OP & UU Fellow; Schmieder: OP; Heinzel: ASU*
• *Objectives (a), (b), (e)*

[31] Berlicki, A., Schmieder, B., Vilmer, N., Aulanier, G., and Del Zanna, G.: 2004a, "Evolution and magnetic topology of the M 1.0 flare of October 22, 2002", *Astronomy & Astrophysics* **423**, 1119–1131
• *Berlicki: OP Fellow; Schmieder, Vilmer, Aulanier: OP*
• *Objectives (a), (b), (d), (e)*

[32] Berlicki, A., Schmieder, B., Vilmer, N., Mein, P., Mein, N., Heinzel, P., Staiger, J., and Deluca, E. E.: 2004b, "Multi-Wavelength Observations of an M1.0 Flare on 22 October 2002", in *IAU Symposium*, 669–+
• *Berlicki: OP Fellow; Schmieder: OP & UiO; Vilmer, Mein, Mein: OP; Heinzel: AsU*
• *Objectives (b)*

[33] Bettonvil, F. C. M., Hammerschlag, R. H., Sütterlin, P., Rutten, R. J., Jägers, A. P., and Snik, F.: 2004, "DOT++: The Dutch Open Telescope wih 1.4-m aperture", in J. Oschmann (Ed.), *Astronomical Telescopes and Instrumentation*, Procs. SPIE 5489, 362–373
• *Sütterlin: ESMN-1 UU Fellow; Rutten: UU & UiO*
• *Objectives (d)*

[34] Bettonvil, F. C. M., Hammerschlag, R. H., Sütterlin, P., Rutten, R. J., Jägers, A. P. L., and Sliepen, G.: 2006, "Tunable H-alpha Lyot filter with advanced servo system and image processing: instrument design and new scientific results with the Dutch Open Telescope", in I. S. McLean and M. Iye (Eds.), *Ground-based and Airborne Instrumentation for Astronomy*, Procs. SPIE 6269, paper 62690E
• *Bettonvil, Hammerschlag: UU; Sütterlin: ESMN-1 UU Fellow; Rutten: UU & UiO*
• *Objective (d)*

[35] Bommier, V., Landi Degl'Innocenti, E., Feautrier, N., and Molodij, G.: 2006a, "Collisional influence on the differential Hanle effect method applied to the second solar spectrum of the $A^2\Pi$-$X^2\Sigma^+$ (0, 0) band of MgH", *Astronomy & Astrophysics* **458**, 625–633
• *Bommier, Molodij: OP; Landi Degl'Innocenti: OAA*
• *Objective (f)*

[36] Bommier, V., Landi Degl'Innocenti, E., Landolfi, M., and Molodij, G.: 2006b, "The Solar Intranetwork Magnetic Field: a Resolved Turbulent Field", *Astronomy & Astrophysics* , in press
• *Bommier, Molodij: OP; Landi Degl'Innocenti, Landolfi: OAA*
• *Objectives (a), (f)*

[37] Bonet, J. A., Márquez, I., Muller, R., Sobotka, M., and Tritschler, A.: 2004, "Phase diversity restoration of sunspot images. I. Relations between penumbral and photospheric features", *Astronomy & Astrophysics* **423**, 737–744
• *Bonet, Márquez: IAC; Sobotka: AsU*
• *Objectives (a), (b), (d)*

[38] Bonet, J. A., Márquez, I., Muller, R., Sobotka, M., and Roudier, T.: 2005, "Phase diversity restoration of sunspot images. II. Dynamics around a decaying sunspot", *Astronomy & Astrophysics* **430**, 1089–1097
• *Bonet: IAC; Sobotka: AsU*
• *Objectives (b), (d)*

[39] Brekke, P., Brynildsen, N., Maltby, P., Fredvik, T., and Kjeldseth-Moe, O.: 2003, "Sunspot Oscillations and Acoustic Wave Propagation", *AAS/Solar Physics Division Meeting* 34
• *Brekke: ESA; Brynildsen, Maltby, Fredvik, Kjeldseth-Moe: UiO*
• *Objective (b)*

[40] Carlsson, M., Rouppe van der Voort, L., and Hansteen, V.: 2004, "Observations at 0.1" Resolution of the Dynamic Evolution of Magnetic Elements", in *IAU Symposium*, 207–210
• *Rouppe van der Voort: UiO Fellow; Carlsson, Hansteen: UiO*
• *Objectives (a), (b), (c), (e)*

[41] Carroll, T., Muglach, K., Balthasar, H., and Collados, M.: 2002, "Application of artificial neural networks to solar infrared Stokes spectra", *Il Nuovo Cimento* **25C, N.5-6**, 581–585
• *Muglach (ESMN 1 AIP Fellow); Carroll, Balthasar: AIP; Collados: IAC*
• *Objectives (a), (d), (f)*

[42] Cauzzi, G., Asensio Ramos, A., Reardon, K., and Janssen, K.: 2005, "Quiet Solar Photosphere: Comparisons of High Resolution Observations with 3-D Simulations", in *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600
• *Asensio Ramos, Janssen: OAA Fellows; Cauzzi, Reardon: OAA*
• *Objectives (a), (f)*

[43] Cauzzi, G., Asensio Ramos, A., Reardon, K. P., and Janssen, K.: 2007a, "Solar High Resolution Spectral Observations Compared with Numerical Simulations", in F. Kupka and I. Roxburg (Eds.), *Convection in Astrophysics*, IAU Symposium 239, in press

- *Asensio Ramos: OAA Fellow & IAC; Cauzzi, Reardon, Janssen: OAA*
- *Objectives (a), (f)*

[44] Cauzzi, G., Vecchio, A., Reardon, K., Janssen, K., and Rimmele, T.: 2007b, "Acoustic shocks in the quiet solar chromosphere ", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
- *Janssen: OAA Fellow; Cauzz, Vecchio, Reardon: OAA*
- *Objectives (a), (c)*

[45] Chatterjee, P., Choudhuri, A., and Petrovay, K.: 2006, "Development of twist in an emerging magnetic flux tube by poloidal field accretion", *Astronomy & Astrophysics* **449**, 781–789
- *Petrovay: ELTE*
- *Objectives (b), (c)*

[46] De Pontieu, B., Carlsson, M., Stein, R., Rouppe van der Voort, L., Löfdahl, M., van Noort, M., Nordlund, Å., and Scharmer, G.: 2006, "Rapid Temporal Variability of Faculae: High-Resolution Observations and Modeling", *Astrophysical Journal* **646**, 1405–1420
- *Carlsson: UiO; Rouppe van der Voort: UiO Fellow; Löfdahl, Scharmer: KVA*
- *Objectives (a), (b), (f); collaboration with industry*

[47] De Pontieu, B., Hansteen, V. H., Rouppe van der Voort, L., van Noort, M., and Carlsson, M.: 2007, "High resolution observations and modeling of dynamic fibrils", *Astrophysical Journal* 655
- *Hansteen, Carlsson: UiO; Rouppe van der Voort: UiO Fellow; van Noort: UiO & KVA*
- *Objectives (a), (b), (c), (f); collaboration with industry*

[48] de Wijn, A. G., Rutten, R. J., Haverkamp, E. M. W. P., and Sütterlin, P.: 2005a, "DOT tomography of the solar atmosphere IV. Magnetic patches in internetwork areas", *Astronomy & Astrophysics* **441**, 1183–1190
- *Sütterlin: ESMN-1 UU Fellow; de Wijn, Haverkamp: UU; Rutten: UU & UiO*
- *Objectives (a), (c)*

[49] de Wijn, A. G., Rutten, R. J., and Tarbell, T. D.: 2005b, "Dynamics of the solar chromosphere. V. High-frequency modulation in ultraviolet image sequences from TRACE", *Astronomy & Astrophysics* **430**, 1119–1127
- *De Wijn: UU; Rutten: UU & UiO*
- *Objective (c); collaboration with industry*

[50] Del Zanna, G., Berlicki, A., Schmieder, B., and Mason, H. E.: 2006, "A Multi-Wavelength Study of the Compact M1 Flare on October 22, 2002", *Solar Physics* **234**, 95–113
- *Berlicki: OP & UU Fellow; Schmieder: OP*
- *Objectives (a), (b), (f)*

[51] Del Zanna, G., Schmieder, B., Mason, H., Berlicki, A., and Bradshaw, S.: 2007, "The gradual phase of the X17 flare on October 28, 2003", *Solar Physics* **240**, in press
- *Schmieder: OP; Berlicki: OP & UU Fellow*
- *Objectives (a), (e)*

[52] Derouich, M.: 2006a, "Anisotropic collisions and impact circular polarization. Application to the solar Halpha line", *Astronomy & Astrophysics* , in press
- *Derouich: IAC Fellow*
- *Objectives (a), (f)*

[53] Derouich, M.: 2006b, "Collisional depolarization of molecular lines. Application to the SiO+H isotropic collisions", *Astronomy & Astrophysics* **449**, 1–7
- *Derouich: IAC Fellow*
- *Objective (f)*

[54] Derouich, M.: 2007, "Calculation of Depolarization and Polarization Rates by Isotropic Collisions with Neutral Hydrogen", in R. Casini and B. Lites (Eds.), *Astronomical Society Pacific Conference Series*, in press
- *Derouich: IAC Fellow*
- *Objective (f)*

[55] Derouich, M., Barklem, P. S., and Sahal-Bréchot, S.: 2005, "Spin depolarizing effect in collisions with neutral hydrogen II. Application to simple/complex ions in spherically symmetric states", *Astronomy & Astrophysics* **441**, 395
• *Derouich: IAC Fellow*
• *Objective (f)*

[56] Derouich, M., Bommier, V., Landi degl'Innocenti, E., Molodij, G., and Sahal-Brechot, S.: 2003, "Diagnostic of turbulent magnetic fields in solar quiet regions by their Hanle effect in the Sr I 4607Å line", in *Semaine de l'Astrophysique Francaise*, F2A-2003: Semaine de l'Astrophysique Franaise, meeting held in Bordeaux, France, June 16-20, 2003., Eds.: F. Combes, D. Barret and T. Contini., EdP-Sciences, 43–44

[57] Derouich, M., Bommier, V., Malherbe, J. M., and Landi Degl'Innocenti, E.: 2006, "Second solar spectrum of the Sr I 4607 Å line: depth probing of the turbulent magnetic field strength in a quiet region", *Astronomy & Astrophysics* **457**, 1047–1052
• *Derouich: IAC Fellow; Bommier, Malherbe: OP; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

[58] Derouich, M., Bommier, V., Malherbe, J. M., Landi Degl'Innocenti, E., and Sahal-Bréchot, S.: 2007, "Interpretation of second solar spectrum observed at the Pic-du-Midi and THEMIS", in R. Casini and B. W. Lites (Eds.), *Solar Polarization 4*, Astronomical Society Pacific Conference Series, in press
• *Derouich: IAC Fellow; Bommier, Malherbe, Sahal-Bréchot: OP; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

[59] Derouich, M., Malherbe, J. M., Bommier, V., Landi degl'Innocenti, E., and Sahal-Bréchot, S.: 2004a, "Second solar spectrum observed at the Pic-du-Midi: depth probing of the turbulent magnetic field intensity in a quiet region.", in F. Combes, D. Barret, T. Contini, F. Meynadier, and L. Pagani (Eds.), *SF2A-2004: Semaine de l'Astrophysique Francaise*, Conference Series, EdP Sciences, 346
• *Malherbe, Bommier: OP; Landi degl'Innocenti: OAA*
• *Objectives (a), (f)*

[60] Derouich, M., Malherbe, J. M., Bommier, V., Landi degl'Innocenti, E., and Sahal-Bréchot, S.: 2004b, "Second solar spectrum observed at the Pic-du-Midi: depth probing of the turbulent magnetic field intensity in a quiet region.", in *Semaine de l'Astrophysique Francaise 2004*, 113
• *Derouich: IAC Fellow; Malherbe, Bommier: OP; Landi degl'Innocenti: OAA*
• *Objectives (a), (f)*

[61] Dorotovic, I. and Rybak, J.: 2003, "Green Corona Versus Photospheric Magnetic Flux: Solar Cycle Dependence", in *Solar Variability as an Input to the Earth's Environment*, Procs. of ISCS 2003 Symposium, ESA SP-535, ESA Publ. Div., ESTEC, Noordwijk, 87–90
• *Rybak: AISAS*
• *Objective (c)*

[62] Elitzur, M. and Asensio Ramos, A.: 2006, "A new exact method for line radiative transfer", *MNRAS* **365**, 779–791
• *Asensio Ramos: OAA Fellow*

[63] Falewicz, R., Siarkowski, M., and Berlicki, A.: 2006, "Hard X-ray emission at the footpoints of solar flares", *Advances in Space Research* **38**, 956–961
• *Berlicki: OP & UU Fellow*
• *Objectives (a), (b)*

[64] Fárník, F. and Karlický, M.: 2007, "Spatial structure and spectra of X-ray sources during the 0.8–4.5 GHz reverse drift bursts observations", *Solar Physics* , in press
• Fárník, Karlický: AsU
• *Objective (c)*

[65] Forgács-Dajka, E., Major, B., and Borkovits, T.: 2004, "Long-term variation in distribution of sunspot groups", *Astronomy & Astrophysics* **424**, 311–315
• *Forgács-Dajka, Major, Borkovits: ELTE*
• *Objective (b)*

[66] Forgács-Dajka, E., Major, B., and Borkovits, T.: 2006, "Searching for mid-term variations in different aspects of solar activity — looking for probable common origins and studying temporal variations of magnetic polarities", *MNRAS* , in press
• *Forgács-Dajka, Major, Borkovits: ELTE*
• *Objectives (a), (b)*

[67] Forgács-Dajka, E. and Borkovits, T.: 2006, "Searching for common mid-term variations in different aspects of solar activity", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, 80
• *Forgács-Dajka, Borkovits: ELTE*
• *Objectives (b), (c)*

[68] Forgács-Dajka, E., Petrovay, K., and Erdélyi, R. (Eds.): 2003, *Contributions on Turbulence, Waves and Instabilities in the Solar Plasma*, Publications of the Astronomy Department of Eötvös University, No. 13, Budapest
• *Forgács-Dajka, Petrovay: ELTE*
• *Objectives (a), (b), (c)*

[69] Gömöry, P., Rybák, J., Kucera, A., Curdt, W., and Wöhl, H.: 2004, "On Mutual Relation Among the Outer Atmospheric Layers in Network: SOHO/CDS Study", in *Proceedings SOHO 13 Workshop*, ESA Special Publication SP-547, 303–306
• *Gömöry, Rybák, Kučera: AISAS*
• *Objectives (b), (c)*

[70] Gömöry, P.: 2006, *Variability and energy transfer in the transition region of the quiet solar atmosphere*, Ph.D. Thesis, Comenius University, Bratislava
• *Gömöry: AISAS*
• *Objective (c)*

[71] Gömöry, P. and Balthasar, H.: 2007, "Magnetic Vector Field above a Sunspot", in F. Kneer, K. G. Puschmann, and A. D. Wittmann (Eds.), *Modern Solar Facilities – Advanced Solar Science*, Universitätsverlag Göttingen, in press
• *Gömöry: AIP Fellow*
• *Objectives (a), (b), (f)*

[72] Gömöry, P., Rybák, J., Kucera, A., Curdt, W., and Wöhl, H.: 2004, "Dynamics of the Quiet Upper Solar Atmosphere in the Network", in *ESA SP-575: SOHO 15 Coronal Heating*, 400–404
• *Gömöry, Rybák, Kučera: AISAS*
• *Objective (c)*

[73] Gömöry, P., Rybák, J., Kučera, A., Curdt, W., and Wöhl, H.: 2005a, "Analysis of Doppler shifts of spectral lines obtained by the CDS/SOHO instrument", in *Solar Magnetic Phenomena, Astrophysics Space Science Library, vol. 320, Springer*, 203–206
• *Gomory, Rybák, Kučera: AISAS*
• *Objective (c)*

[74] Gömöry, P., Rybák, J., Kučera, A., Curdt, W., and Wöhl, H.: 2005b, "Variability and Dynamics of the Outer Atmospheric Layers in the Quiet Solar Network", *Hvar Observatory Bulletin* **29**, 71–78
• *Gömöry, Rybák, Kučera, Tomasz: AISAS*
• *Objective (c)*

[75] Gömöry, P., Rybák, J., Kučera, A., Curdt, W., and Wöhl, H.: 2006, "SOHO/CDS observations of waves above the network", *Astronomy & Astrophysics* **448**, 1169–1175
• *Gömöry, Rybák, Kučera: AISAS*
• *Objective (c)*

[76] Gömöry, P., Rybák, J., Kučera, A., Curdt, W., and Wöhl, H.: 2007, "Propagating Waves Detected in the Chromospheric Network", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press

- *Gömöry, Rybák, Kučera: AISAS*
- *Objective (c)*

[77] Gömöry, P., Rybák, J., Kučera, A., and Wöhl, H.: 2005c, "Analysis of Dynamics of Loops in an Active Region Associated with a Small C-Class Flare", in D. E. Innes, A. Lagg, and S. K. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596, 56–59
- *Gömöry, Rybák, Kučera: AISAS*
- *Objectives (b)*

[78] Gudiksen, B. V.: 2004, *The coronal heating problem*, Ph.D. Thesis Stockholm University
- *Boris Gudiksen: ESMN-1 KVA Fellow*
- *Objectives (c), (f)*

[79] Gunár, S., Schmieder, B., and Heinzel, P.: 2007, "Prominence parameters derived by 2D modeling from hydrogen Lyman series measured by SOHO/SUMER", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
- Schmieder: OP; Heinzel, Gunár: AsU
- *Objective (a)*

[80] Hammerschlag, R. H., Bettonvil, F. C. M., Jägers, A. P. L., and Rutten, R. J.: 2007, "Aperture Increase Options for the Dutch Open Telescope", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
- *Hammerschlag, Bettonvil: UU; Rutten: UU & UiO,*
- *Objective (d)*

[81] Hanslmeier, A., Kucera, A., Rybák, J., and Wöhl, H.: 2004, "Two-dimensional spectroscopic time series of solar granulation", *Solar Physics* **223**, 13–26
- *Kučera, Rybák: AISAS*
- *Objective (a)*

[82] Hansteen, V. H., De Pontieu, B., Rouppe van der Voort, L., van Noort, M., and Carlsson, M.: 2006, "Dynamic Fibrils Are Driven by Magnetoacoustic Shocks", *Astrophysical Journal Letters* **647**, L73–L76
- *Hansteen, Carlsson: UiO; Rouppe van der Voort: UiO Fellow; van Noort: UiO & KVA*
- *Objectives (a), (b), (c), (f); collaboration with industry*

[83] Heinzel, P.: 2007, "The Fine Structure of Solar Prominences", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
- Heinzel: AsU
- *Objective (a)*

[84] Heinzel, P., Schmieder, B., and Vial, J.: 2007, "What have we learned about prominences and filaments from SOHO/SUMER and CDS spectral observations?", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, in press
- *Schmieder: OP, Heinzel: AsU*
- *Objectives (a), (b), (e)*

[85] Hirzberger, J., Stangl, S., Gersin, K., Jurčák, J., Puschmann, K. G., and Sobotka, M.: 2005, "The structure of a penumbral connection between solar pores", *Astronomy & Astrophysics* **442**, 1079–1086
- Jurčák, Sobotka: AsU
- *Objectives (a)*

[86] Janssen, K. and Cauzzi, G.: 2006, "Dynamics of the solar photosphere with IBIS. I. Reversed intensity structure in the mid-photosphere", *Astronomy & Astrophysics* **450**, 365–374
- *Janssen: OAA Fellow; Cauzzi: OAA*
- *Objectives (a), (c)*

[87] Janssen, K. and Cauzzi, G.: 2007a, "Reversed granulation", in F. Kneer, K. G. Puschmann, and A. D. Wittmann (Eds.), *Modern Solar Facilities – Advanced Solar Science*, Universitätsverlag Göttingen, in press
- *Janssen: OAA Fellow; Cauzzi: OAA*
- *Objective (a)*

[88] Janssen, K. and Cauzzi, G.: 2007b, "Reversed Granulation In Mid-Photosphere Of The Sun", in F. Kupka and I. Roxburg (Eds.), *Convection in Astrophysics*, IAU Symposium 239, in press newline • *Janssen: OAA Fellow; Cauzzi: OAA*
• *Objectives (a), (c)*

[89] Janßen, K., Cauzzi, G., Falchi, A., Cavallini, F., and Reardon, K.: 2004, "IBIS Observations of Quiet Sun Photosphere - Velocity Structure from Fe I 7090.4 Å", in *IAU Symposium 223*, 631–632
• *Janßen: OAA Fellow; Cauzzi, Falchi, Cavallini, Reardon: OAA*
• *Objectives (d), (f)*

[90] Janssen, K. and Kneer, F.: 2003, "Speckle spectro-polarimetry of magnetic structures", *Astronomische Nachrichten* **324**, 328–329
• *Janssen (OAA Fellow)*
• *Objectives (a) (d)*

[91] Janssen, K., Vogler, A., and Kneer, F.: 2003, "On the fractal dimension of small-scale magnetic structures in the Sun", *Astronomy & Astrophysics* **409**, 1127–1134
• *Janssen (OAA Fellow)*
• *Objectives (a), (c), (f)*

[92] Jurčák, J., Martínez Pillet, V., and Sobotka, M.: 2006a, "The magnetic canopy above light bridges", *Astronomy & Astrophysics* **453**, 1079–1088
• *Jurčák, Sobotka: AsU; Martínez Pillet: IAC*
• *Objective (b)*

[93] Jurčák, J., Sobotka, M., and Martínez Pillet, V.: 2005, "The Magnetic Configuration in Light Bridges", in *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600
• *Jurčák, Sobotka: AsU; Martínez Pillet: IAC*
• *Objective (b)*

[94] Jurčák, J., Sobotka, M., and Martínez Pillet, V.: 2006b, "The Canopy Structure above Light Bridges", *Central European Astrophysical Bulletin* **30**, 55–64
• *Jurčák, Sobotka: AsU; Martínez Pillet: IAC*
• *Objective (b)*

[95] Kashapova, L. K., Kotrč, P., and Kupryakov, Y. A.: 2007, "Diagnostics of accelerated particle beams by spectral observations in Balmer series lines", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Kotrč: AsU
• *Objective (a)*

[96] Kašparová, J., Varady, M., Karlický, M., Heinzel, P., and Moravec, Z.: 2007, "H-alpha line in solar atmosphere heated by particle beams", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Kašparová, Karlický, Heinzel: AsU
• *Objective (b)*

[97] Kotrč, P., Heinzel, P., Tziotziou, K., and Tsiropoula, G.: 2004, "Parameters of dark mottles based on high resolution optical spectra", in *IAU Symposium 223*, 275–276
• *Tziotziou: UU Fellow; Kotrč, Heinzel: ASU*
• *Objectives (a), (b)*

[98] Kotrč, P., Schwartz, P., Heinzel, P., Tsiropoula, G., and Tziotziou, K.: 2005, "Diagnostics of Dark Chromospheric Mottles Based on High Resolution Spectra I - Observational Data", *Hvar Observatory Bulletin* **29**, 289–298
• *Tziotziou: UU Fellow; Kotrč, Schwartz, Heinzel: ASU*
• *Objectives (a), (b)*

[99] Kotrč, P.: 2007, "The modernized solar optical spectrograph at the Ondřejov observatory", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Kotrč: AsU
• *Objective (d)*

[100] Koza, J. and Kučera, A.: 2005, "Response Functions of Spectral Lines Suitable for Diagnostics of Solar Rotation", *Hvar Observatory Bulletin* **29**, 21–30
• *Koza, Kučera: AISAS*
• *Objective (a), (f)*

[101] Koza, J., Kučera, A., BEllot Rubio, L., Rybák, J., Hanslmeier, A., and Wöhl, H.: 2004, "Velocity field in the intergranular atmosphere", *Hvar Observatory Bulletin* **28**, 19–26
• *Koza, Rybák, Kučera: AISAS*
• *Objectives (a), (f)*

[102] Koza, J., Kučera, A., Rybák, J., and Wöhl, H.: 2006a, "The height dependence of quiet-sun photospheric temperature fluctuations in observations and simulations", in J. Leibacher, H. Uitenbroek, and R. Stein (Eds.), *Solar MHD Theory and Observations - a High Spatial Resolution Perspective*, Astronomical Society Pacific Conference Series 354, 43–48
• *Koza, Kučera, Rybák: AISAS*
• *Objective (f)*

[103] Koza, J., Kučera, A., Rybák, J., and Wöhl, H.: 2006b, "Photospheric modeling through spectral line inversion. Temperature and radial velocity stratifications and fluctuations", *Astronomy & Astrophysics* **458**, 941–951
• *Koza, Kučera, Rybák: AISAS*
• *Objective (f)*

[104] Koza, J., Kučera, A., Rybák, J., and Wöhl, H.: 2007a, "The Height Dependence of Temperature – Velocity Correlation in the Solar Photosphere", in F. Kneer, K. G. Puschmann, and A. D. Wittmann (Eds.), *Modern Solar Facilities – Advanced Solar Science*, Universitätsverlag Göttingen, in press

[105] Koza, J., Sütterlin, P., Kučera, A., and Rybák, J.: 2007b, "Temporal variation in orientation of fibrils in plage", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Koza, Sütterlin, Kučera, Rybák: AISAS, UU*
• *Objectives (a), (c)*

[106] Kučera, A., Wöhl, H., and Rybák, J.: 2006a, "Spectral Characteristics of a Photosphere near a Flare", *Central European Astrophysical Bulletin* in press
• *Kučera, Rybák: AISAS*
• *Objective (b), (c)*

[107] Kučera, A., Wöhl, H., Rybák, J., Gömöry, P., and Tomasz, F.: 2005, "High Resolution Observations of a M5.4 Flare", *Hvar Observatory Bulletin* **29**, 177–186
• *Kučera, Rybák, Gömöry, Tomasz : AISAS*
• *Objective (b), (e)*

[108] Kučera, A., Wöhl, H., Rybák, J., Gömöry, P., and Veronig, A.: 2006b, "Multi-wavelength High Resolution Observations of a M5.4 Flare from Ground and Space", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, in press
• *Kučera, Rybák, Gömöry: AISAS*
• *Objective (b), (e)*

[109] Langhans, K.: 2007, "Signatures of penumbral magnetic field at very high spatial resolution", in R. Casini and B. W. Lites (Eds.), *Solar Polarization 4*, Astronomical Society Pacific Conference Series, in press
• *Langhans: KVA Fellow*
• *Objective (a)*

[110] Langhans, K., Scharmer, G. B., Kiselman, D., and Löfdahl, M. G.: 2007, "Observations of dark-cored filaments in sunspot penumbrae", *Astronomy & Astrophysics* , in press
• *Langhans: KVA Fellow; Scharmer, Kiselman, Löfdahl: KVA*
• *Objective (a)*

[111] Langhans, K., Scharmer, G. B., Kiselman, D., Löfdahl, M. G., and Berger, T. E.: 2005, "Inclination of magnetic fields and flows in sunspot penumbrae", *Astronomy & Astrophysics* **436**, 1087–1101
• *Kai Langhans: KVA Fellow; Scharmer, Kiselman, Löfdahl: KVA*
• *Objectives (a), (d); collaboration with industry*

[112] Langhans, K., Schmidt, W., and Rimmele, T.: 2004, "Diagnostic spectroscopy of G-band brightenings in the photosphere of the sun", *Astronomy & Astrophysics* **423**, 1147–1157
• *Kai Langhans: KVA Fellow*
• *Objectives (a), (d)*

[113] Leenaarts, J., Rutten, R. J., Carlsson, M., and Uitenbroek, H.: 2006a, "A comparison of proxy-magnetometry diagnostics", *Astronomy & Astrophysics* **452**, L15–L18
• *Leenaarts, UU; Rutten: UU & UiO; Carlsson: UiO*
• *Objectives (a), (d), (f)*

[114] Leenaarts, J., Rutten, R. J., Sütterlin, P., Carlsson, M., and Uitenbroek, H.: 2006b, "DOT tomography of the solar atmosphere VI. Magnetic elements as bright points in the blue wing of Hα", *Astronomy & Astrophysics* **449**, 1209–1218
• *Leenaarts: UU; Rutten: UU & UiO; Sütterlin: UU; Carlsson UiO*
• *Objectives (a), (d), (f)*

[115] Li, H., Berlicki, A., and Schmieder, B.: 2005a, "Thermal and non-thermal effects driven by magnetic reconnections observed in a confined flare", *Astronomy & Astrophysics* **438**, 325–339
• *Li: PMO; Berlicki: OP Fellow; Schmieder: OP & UiO*
• *Objectives (b), (c)*

[116] Li, H., Li, J.-P., Fang, C., Schmieder, B., Berlicki, A., and Du, Q.-S.: 2005b, "A Multi-Wavelength Study of the 3B/X1.2 Flare Observed on 2003 October 26", *Chinese Journal of Astronomy and Astrophysics* **5**, 645–664
• *Berlicki: OP fellow, Schmieder: OP*
• *Objectives (a), (b), (d)*

[117] Li, H., Schmieder, B., Aulanier, G., and Berlicki, A.: 2006, "Is Pre-Eruptive Null Point Reconnection Required for Triggering Eruptions?", *Solar Physics* **237**, 85–100
• *Berlicki: OP fellow; Schmieder, Aulanier: OP*
• *Objectives (a), (b)*

[118] Lin, Y., Engvold, O., Rouppe van der Voort, L., Wiik, J. E., and Berger, T. E.: 2005a, "Thin Threads of Solar Filaments", *Solar Physics* **226**, 239–254
• *Rouppe van der Voort: UiO Fellow; Lin, Engvold, Wiik: UiO*
• *Objectives (a), (c); collaboration with industry*

[119] Lin, Y., Wiik, J. E., Engvold, O., Rouppe van der Voort, L., and Frank, Z. A.: 2005b, "Solar Filaments and Photospheric Network", *Solar Physics* **227**, 283–297
• *Rouppe van der Voort: UiO Fellow; Lin, Engvold, Wiik: UiO*
• *Objectives (a), (c)*

[120] Major, B.: 2004, "Fine structure of the butterfly diagram revisited", in *IAU Symposium*, 121–122
• *Major: ELTE*
• *Objectives (b), (c)*

[121] Major, B.: 2005, "On the behaviour of sunspots in solar plasma: sunspot decay", *Publications of the Astronomy Deparment of the Eotvos Lorand University* **15**, 27–33
• *Major: ELTE*
• *Objectives (b), (c)*

[122] Manso Sainz, R. and Landi Degl'Innocenti, E.: 2002, "A Qualitative Interpretation of the Second Solar Spectrum of Ti I", *Astronomy and Astrophysics* **394**, 1093–1101
• *Manso Sainz: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (d),(f)* www =
• *WWW: http://adsabs.harvard.edu*

[123] Manso Sainz, R., Landi Degl'Innocenti, E., and Trujillo Bueno, J.: 2004, "Concerning the Existence of a "Turbulent" Magnetic Field in the Quiet Sun", *Astrophysical Journal Letters* **614**, 89–91
• *Manso Sainz, Trujillo Bueno: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (d), (f)*

[124] Manso Sainz, R., Landi Degl'Innocenti, E., and Trujillo Bueno, J.: 2006, "A qualitative interpretation of the second solar spectrum of Ce II", *Astronomy & Astrophysics* **447**, 1125–1129
• *Manso Sainz, Trujillo Bueno: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

[125] McIntosh, S. W., Fleck, B., and Judge, P. G.: 2003, "Investigating the role of plasma topography on chromospheric oscillations observed by TRACE", *Astronomy & Astrophysics* **405**, 769–777
• *McIntosh: ESA ESMN-1 Fellow; Fleck: ESA*
• *Objectives: (a), (b)*

[126] Mein, N., Tziotziou, K., and Mein, P.: 2003, "Some results from THEMIS/MSDP observations", in *THEMIS Workshop*, Procs. of THEMIS Workshop, Observatoire Midi Pyrénées, Toulouse, France, 233–236
• *Tziotziou: UU Fellow; Mein, Mein: OP*
• *Objectives (a), (b), (c), (f)*

[127] Mein, P. and Tziotziou, K.: 2003, "2D THEMIS/MSDP spectropolarimetry: results, constrains and prospects", in *THEMIS Workshop*, Procs. of THEMIS Workshop, Observatoire Midi Pyrénées, Toulouse, France, 49–56
• *Tziotziou: UU Fellow; Mein: OP*
• *Objectives (a), (b), (c), (d), (f)*

[128] Merenda, L., Trujillo Bueno, J., and Collados, M.: 2007, "A Magnetic Map of a Solar Coronal Filament", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Merenda: IAC Fellow; Trujillo Bueno, Collados: IAC,*
• *Objectives (a), (f)*

[129] Merenda, L., Trujillo Bueno, J., Landi degl'Innocenti, E., and Collados, M.: 2005, "Determination of the Magnetic Field Vector in a Polar Crown Prominence via the Hanle and Zeeman Effects in the He I 10830 Å Multiplet.", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Merenda: IAC Fellow; Trujillo Bueno, Collados: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

[130] Merenda, L., Trujillo Bueno, J., Landi Degl'Innocenti, E., and Collados, M.: 2006, "Determination of the Magnetic Field Vector via the Hanle and Zeeman Effects in the He I λ10830 Multiplet: Evidence for Nearly Vertical Magnetic Fields in a Polar Crown Prominence", *Astrophysical Journal* **642**, 554–561
• *Merenda: IAC Fellow; Trujillo Bueno, Collados: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

[131] Messerotti, M., Coretti, I., Padovan, S., Zlobec, P., Antonucci, E., Cora, A., Volpicelli, C. A., Dimitoglou, G., Reardon, K., Tripicchio, A., Severino, G., and the EGSO Team: 2003, "The Italian solar data archives: national and European perspectives", *title* **74**, 391–394
• *Dimitoglou: ESA: Reardon: OAA*
• *Objective (e)*

[132] Mészárosová, H., Karlický, M., Rybák, J., Farnik, F., and Jiřička, K.: 2006, "Long period variations of dm-radio and X-ray fluxes in three X-class flares", **460**, 865–874
• *Rybák: AISAS, Mészárosová, Karlický, Farnik, Jiřička: AsU*
• *Objective (b)*

[133] Mészárosová, H., Rybák, J., Zlobec, P., Magdalenić, J., Karlický, M., and Jiřička, K.: 2005, "Statistical Analysis of Pulsations and Pulsations with Fibers in the Range 800-2000 MHZ", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 133–136
• *Rybák: AISAS, Mészárosová, Karlický, Farnik, Jiřička: AsU*
• *Objective (b)*

[134] Mocak, M. and Rybak, J.: 2003, "On Evolution of the Photospheric Magnetic Fields on the Sun: Separation of Active/Dissipative/Background Fields by Optimum Thresholds", in *Solar Variability as an Input to the Earth's Environment*, Procs. of ISCS 2003 Symposium, ESA SP-535, ESA Publ. Div., ESTEC, Noordwijk, 137–140
• *Rybak, Mocak: AISAS*
• *Objective (a)*

[135] Muglach, K.: 2003, "Dynamics of Solar Active Regions. I. Photospheric and chromospheric Oscillations observed with TRACE", *Astronomy and Astrophysics* **401**, 685–698
• *Muglach: (ESMN-1 Fellow, AIP)*
• *Objectives (b), (c)*

[136] Odert, P., Hanslmeier, A., Rybák, J., Kučera, A., and Wöhl, H.: 2005, "Influence of the 5-min oscillations on solar photospheric layers. I. Quiet region", *Astronomy & Astrophysics* **444**, 257–264
• *Rybák, Kučera: AISAS*
• *Objective (b)*

[137] Ozguc, A., Atac, T., and Rybak, J.: 2003, "Short-term Periodicities in the Flare Index Between the Years 1966-2001", in *Solar Variability as an Input to the Earth's Environment*, Procs. of ISCS 2003 Symposium, ESA SP-535, ESA Publ. Div., ESTEC, Noordwijk, 141–144
• *Rybak: AISAS*
• *Objective (b)*

[138] Özgüç, A., Ataç, T., and Rybák, J.: 2004a, "Evaluation of the short-term periodicities in the flare index between the years 1966 2002", *Solar Physics* **223**, 287–304
• *Rybák: AISAS*
• *Objective (b)*

[139] Özgüç, A., Ataç, T., and Rybák, J.: 2004b, "Evidence of the fundamental periodicity in the flare index between the years 1966-2002", in *IAU Symposium*, 557–558
• *Rybák: AISAS*
• *Objective (b)*

[140] Pariat, E., Aulanier, G., Schmieder, B., Georgoulis, M. K., Rust, D. M., and Bernasconi, P. N.: 2004, "Resistive Emergence of Undulatory Flux Tubes", *Astrophysical Journal* **614**, 1099–1112
• *Pariat, Aulanier: OP; Schmieder: OP & UiO*
• *Objectives (a), (c)*

[141] Pariat, E., Schmieder, B., Berlicki, A., and Lopez-Ariste, A.: 2007, "Spectro photometry of Ellerman Bombs observed with THEMIS", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• *Schmieder, Demoulin, Pariat: OP; Berlicki: OP & UU Fellow*
• *Objectives (a), (b)*

[142] Petrovay, K.: 2005, "The Sun as a laboratory for turbulence theory: the problem of anomalous diffusion", *Pub. Astronomy Dept. Eotvos Lorand Univ.* **15**, 53–58
• *Petrovay: ELTE*
• *Objectives (b), (c)*

[143] Petrovay, K., Chaterjee, P., and Choudhuri, A.: 2006, "Helical Magnetic Fields in Solar Active Regions: Theory vs. Observations", *Publ. Astronomy Dept. Eotvos Lorand Univ.* **17**, 5
• *Petrovay: ELTE*
• *Objectives (a), (b)*

[144] Petrovay, K., Chaterjee, P., and Choudhuri, A.: 2006a, "On The Origin of Current Helicity in Active Regions", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, 46
• *Petrovay: ELTE*
• *Objective (b)*

[145] Petrovay, K., Erdélyi, R., and Thompson, M.: 2006b, "Sound Wave Travel Times in Plage Areas - The Effect of Abnormal Granulation", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, 52
• *Petrovay: ELTE*
• *Objectives (a), (c)*

[146] Petrovay, K., Erdélyi, R., and Thompson, M.: 2006c, "The Effect of Abnormal Granulation on Acoustic Wave Travel Times and Mode Frequencies", *Solar Physics* , in press
• *Petrovay: ELTE*
• *Objectives (a), (c)*

[147] Prosecký, T., Kotrč, P., and Berlicki, A.: 2006, "On Line Profile Asymmetries in a Solar Flare", *Central European Astrophysical Bulletin* **30**, 31–41
• *Berlicki: OP fellow; Kotrč: AsU*
• *Objectives (a), (f)*

[148] Ramelli, R., Bianda, M., Trujillo Bueno, J., Merenda, L., and Stenflo, J. O.: 2005, "Spectropolarimetric Observations of Prominences and Spicules and Magnetic Field Diagnostics", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Merenda: IAC Fellow; Trujillo Bueno: IAC*
• *Objectives (a), (f)*

[149] Reardon, K., Casini, R., Cavallini, F., Tomczyk, S., Rouppe van der Voort, L., Van Noort, M., Woeger, F., Socas Navarro, H., and IBIS Team: 2006, "High Resolution Spectropolarimetry of Penumbral Formation with IBIS", in *AAS/Solar Physics Division Meeting*, 35.03
• *van Noort: KVA; Rouppe van der Voort: UiO Fellow*
• *Objective (d)*

[150] Régnier, S. and Amari, T.: 2004, "3D magnetic configuration of the Hα filament and X-ray sigmoid in NOAA AR 8151", *Astronomy & Astrophysics* **425**, 345–352
• *Régnier: ESA Fellow*
• *Objectives (b), (f)*

[151] Régnier, S., Amari, T., and Canfield, R. C.: 2005a, "Self and mutual magnetic helicities in coronal magnetic configurations", *Astronomy & Astrophysics* **442**, 345–349
• *Régnier: ESA Fellow*
• *Objectives (b), (f)*

[152] Régnier, S. and Canfield, R. C.: 2004, "Energetics of Flares: How is the Magnetic Energy Stored and Released?", in *SOHO 15 Coronal Heating*, ESA-SP 575
• *Régnier: ESA Fellow*
• *Objectives: (b), (f)*

[153] Régnier, S. and Canfield, R. C.: 2005a, "Describing Coronal Magnetic Fields by Successive Force-Free Equilibia", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Régnier: ESA Fellow*
• *Objectives (b), (f)*

[154] Régnier, S. and Canfield, R. C.: 2005b, "Evidence of Small Scale Reconnection in a Moving Feature", in *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600
• *Régnier: ESA Fellow*
• *Objectives (b), (f)*

[155] Régnier, S. and Canfield, R. C.: 2006, "Evolution of magnetic fields and energetics of flares in active region 8210", *Astronomy & Astrophysics* **451**, 319–330
• *Régnier: ESA Fellow*
• *Objectives (b), (f)*

[156] Régnier, S. and Fleck, B.: 2004, "Magnetic Field Evolution of AR 0486 before and after the X17 flare on October 28, 2003", in *SOHO 15 Coronal Heating*, ESA-SP 575
• *Régnier: ESA Fellow*
• *Objectives: (b), (f)*

[157] Régnier, S., Fleck, B., Abramenko, V., and Zhang, H.-Q.: 2005b, "Evolution of the Magnetic Energy Budget in AR 10486 from Potential and Nonlinear Force-Free Models", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Régnier: ESA Fellow*
• *Objectives (b), (f)*

[158] Rouppe van der Voort, L. H. M.: 2003, "On the time variability of the Evershed effect", *Astronomy & Astrophysics* **397**, 757–764
• *Rouppe van der Voort: UiO Fellow*
• *Objective (a)*

[159] Rouppe van der Voort, L. H. M., Hansteen, V. H., Carlsson, M., Fossum, A., Marthinussen, E., van Noort, M. J., and Berger, T. E.: 2005, "Solar magnetic elements at 0.1 arcsec resolution. II. Dynamical evolution", *Astronomy & Astrophysics* **435**, 327–337
• *Rouppe van der Voort: UiO Fellow; Hansteen, Carlsson, Fossum, Marthinussen, van Noort: UiO*
• *Objectives (a), (b), (c), (e); collaboration with industry*

[160] Rouppe van der Voort, L. H. M., Löfdahl, M. G., Kiselman, D., and Scharmer, G. B.: 2004, "Penumbral structure at 0.1 arcsec resolution. I. General appearance and power spectra", *Astronomy & Astrophysics* **414**, 717–726
• *Rouppe van der Voort: UiO Fellow; Löfdahl, Kiselman, Scharmer: KVA*
• *Objectives (a), (b)*

[161] Rouppe van der Voort, L. H. M., Rutten, R. J., Sütterlin, P., Sloover, P. J., and Krijger, J. M.: 2003, "La Palma observations of umbral flashes", *Astronomy & Astrophysics* **403**, 277–285
• *Rouppe van der Voort: UiO Fellow: KVA; Rutten: UU, UiO; Sütterlin, Sloover, Krijger: UU*
• *Objectives (b), (e)*

[162] Rutten, R. J., Bettonvil, F. C. M., Hammerschlag, R. H., Jägers, A. P. L., Leenaarts, J., Snik, F., Sütterlin, P., Tziotziou, K., and de Wijn, A. G.: 2004, "The Dutch Open Telescope on La Palma", in *IAU Symposium 223*, 597–604
• *Tziotziou: UU Fellow; Sütterlin: ESMN-1 UU Fellow; Rutten: UU & UiO*
• *Objectives (a), (b), (c), (d), (e)*

[163] Rutten, R. J., de Wijn, A. G., and Sütterlin, P.: 2004a, "DOT tomography of the solar atmosphere II. Reversed granulation in Ca II H", *Astronomy & Astrophysics* **416**, 333–340
• *Suetterlin: ESMN-1 UU Fellow*
• *Objectives (a), (c)*

[164] Rutten, R. J., Hammerschlag, R. H., Bettonvil, F. C. M., Sütterlin, P., and de Wijn, A. G.: 2004b, "DOT tomography of the solar atmosphere I. Telescope summary and program definition", *Astronomy & Astrophysics* **413**, 1183–1189
• *Suetterlin: ESMN-1 UU Fellow*
• *Objectives (d), (e)*

[165] Rybák, J., Bendik, P., Temmer, M., Veronig, A., and Hanslmeier, A.: 2004a, "Merging two data sets of hemispheric sunspot numbers", *Hvar Observatory Bulletin* **28**, 63–70
• *Rybák: AISAS*
• *Objective (b)*

[166] Rybak, J. and Karlovsky, V.: 2003, "Mutual Relations of the Intermediate Periodicities of the Wolf Sunspot Number", in *Solar Variability as an Input to the Earth's Environment*, Procs. of ISCS 2003 Symposium, ESA SP-535, ESA Publ. Div., ESTEC, Noordwijk, 145–148
• *Rybak: AISAS*
• *Objective (a)*

[167] Rybák, J., Kucera, A., Curdt, W., and Wöhl, H.: 2004b, "On Relations among the Calibrated Parameters of the Transition Region Spectral Line", in *Proceedings SOHO 13 Workshop*, ESA Special Publication SP-547, 311–314
• *Rybák, Kučera: AISAS*
• *Objective (c)*

[168] Rybák, J., Kucera, A., Curdt, W., and Wöhl, H.: 2004c, "Observational Evidences for Heating of the Solar Corona by Nanoflares in the Network Derived from the Transition Region Spectral Lines", in *ESA SP-575: SOHO 15 Coronal Heating*, 529–534
• *Rybák, Kučera: AISAS*
• *Objective (c)*

[169] Rybák, J., Kučera, A., Wöhl, H., Wedemeyer-Bohm, S., and Steiner, O.: 2006, "A New Method for Comparing Numerical Simulations and Spectroscopic Observations of the Solar Photosphere", in J. Leibacher, H. Uitenbroek, and R. Stein (Eds.), *Solar MHD: Theory and Observations - a High Spatial Resolution Perspective*, Astronomical Society Pacific Conference Series 354, 80–85
• *Rybák, Kučera: AISAS*
• *Objective (b)*

[170] Rybák, J., Özgüç, A., Ataç, T., and Sözen, E.: 2005, "Intermittence of the short-term periodicities of the flare index", *Advances in Space Research* **35**, 406–409
• *Rybák: AISAS*
• *Objective (b)*

[171] Rybák, J., Wöhl, H., Kučera, A., Hanslmeier, A., and Steiner, O.: 2004d, "Indications of shock waves in the solar photosphere", *Astronomy & Astrophysics* **420**, 1141–1152
• *Rybák, Kučera: AISAS*
• *Objectives (a), (c), (f)*

[172] Sánchez-Andrade Nuño, B., Puschmann, K. G., Cuberes, M. S., Blanco Rodríguez, J., and Kneer, F.: 2005a, "Chromospheric dynamics of a solar active region", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 70
• *Sánchez Cuberes: AIP Fellow*
• *Objectives (b), (c)*

[173] Sánchez-Andrade Nuño, B., Puschmann, K. G., Sánchez Cuberes, M., Blanco Rodríguez, J., and Kneer, F.: 2005b, "Analysis of a Wide Chromospheric Active Region", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Sánchez Cuberes: AIP Fellow*
• *Objectives (b), (c)*

[174] Sánchez Cuberes, M., Puschmann, K. G., and Wiehr, E.: 2004, "Polarimetry of a sunspot at disk centre", *IAU Symposium* **223**, 237–238
• *Sánchez Cuberes: AIP Fellow*
• *Objectives (a), (b), (f)*

[175] Sánchez Cuberes, M., Puschmann, K. G., and Wiehr, E.: 2005, "Spectropolarimetry of a sunspot at disk centre", *Astronomy & Astrophysics* **440**, 345–356

- *Sánchez Cuberes: AIP Fellow*
- *Objectives (a), (b), (f)*

[176] Sánchez Cuberes, M., Vázquez, M., Bonet, J., and M., S.: 2003, "Center to limb variation of quiet solar granulation in the infrared", *Astronomy and Astrophysics* **397**, 1075–1081
- *Sánchez Cuberes: ESMN-2 fellow, AIP; Vázquez, Bonet: IAC; Sobotka: AsU*
- *Objectives*

[177] Scharmer, G. B., Dettori, P., Löfdahl, M. G., and Shand, M.: 2003, "Adaptive optics system for the new Swedish solar telescope", in S. Keil and S. Avakyan (Eds.), *Innovative Telescopes and Instrumentation for Solar Astrophysics*, Vol. 4853, Procs. SPIE, 370–380
- *Scharmer, Dettori, Löfdahl: KVA; Shand: industry*
- *Objective: collaboration with industry*

[178] Scharmer, G. B., Gudiksen, B. V., Kiselman, D., Löfdahl, M. G., and Rouppe van der Voort, L. H. M.: 2002, "Dark cores in sunspot penumbral filaments", *Nature* **420**, 151–153
- *Gudiksen: ESMN1 KVA Fellow; Rouppe van der Voort: UiO Fellow; Scharmer, Kiselman, Löfdahl: KVA*
- *Objective (a)*

[179] Scharmer, G. B., Langhans, K., Kiselman, D., and Löfdahl, M. G.: 2007, "Recent high resolution observations and interpretations of sunspot fine structure", in K. Shibata, S. Nagata, and T. Sakurai (Eds.), *The New Solar Physics with Solar-B Mission*, Astronomical Society Pacific Conference Series, in press
- *Langhans: KVA Fellow*
- *Objectives (a), (d), (f)*

[180] Schmieder, B., Berlicki, A., Li, H., and et al.: 2005, "Flows and Heating of the Solar Atmosphere during Solar Flares", in *Connecting Sun and Heliosphere*, European Space Agency SP-592, 543
- *Schmieder: OP; Berlicki: OP & UU Fellow*
- *Objectives (a), (b)*

[181] Schmieder, B., Berlicki, A., Vilmer, N., Aulanier, G., Démoulin, P., Mein, P., Mandrini, C., and Deluca, E.: 2004a, "Multi-wavelength flare study and magnetic configuration", in *IAU Symposium*, 397–398
- *Berlicki: OP Fellow; Schmieder: OP & UiO; Vilmer, Aulanier, Démoulin, Mein: OP*
- *Objectives (b), (c)*

[182] Schmieder, B., Lin, Y., Heinzel, P., and Schwartz, P.: 2004b, "Multi-wavelength study of a high-latitude EUV filament", *Solar Physics* **221**, 297–323
- *Schmieder: OP; Heinzel, Schwartz: AsU*
- *Objectives (b), (e)*

[183] Schmieder, B., Mandrini, C., Démoulin, P., Berlicki, A., and Li, H.: 2007, "Magnetic sources of flares and CMEs from multi-wavelength flare studies", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, in press
- *Schmieder, Demoulin: OP, Berlicki: OP & UU Fellow*
- *Objectives (a), (b)*

[184] Schmieder, B., Mandrini, C. H., Démoulin, P., Pariat, E., Berlicki, A., and Deluca, E.: 2006, "Magnetic reconfiguration before the X 17 Solar flare of October 28 2003", *Advances in Space Research* **37**, 1313–1316
- *Schmieder, Démoulin, Pariat: OP; Berlicki: OP & UU Fellow*
- *Objectives (a), (b), (e)*

[185] Schmieder, B., Mein, N., Deng, Y., Dumitrache, C., Malherbe, J.-M., Staiger, J., and Deluca, E. E.: 2004c, "Magnetic changes observed in the formation of two filaments in a complex active region: TRACE and MSDP observations", *Solar Physics* **223**, 119–141
- *Schmieder: OP & UiO; Mein, Malherbe: OP*
- *Objectives (a), (c)*

[186] Schmieder, B., Rust, D. M., Georgoulis, M. K., Démoulin, P., and Bernasconi, P. N.: 2004d, "Emerging Flux and the Heating of Coronal Loops", *Astrophysical Journal* **601**, 530–545
• *Schmieder: OP & UiO; Démoulin: OP*
• *Objectives (b), (c)*

[187] Schmieder, B., Tziotziou, K., and Heinzel, P.: 2003, "Spectroscopic diagnostics of an Hα and EUV filament observed with THEMIS and SOHO", *Astronomy and Astrophysics* **401**, 361–375
• *Tziotziou: UU Fellow; Schmieder: OP, UiO; Heinzel: AsU*
• *Objectives (f)*

[188] Schmieder, B., Tziotziou, K., Heinzel, P., Malherbe, J.-M., and Curdt, W.: 2002, "Filament absorption study using THEMIS and SOHO/CDS-SUMER observations", *Il Nuovo Cimento* **25C, N.5-6**, 775–782
• *Tziotziou: UU Fellow; Schmieder: OP, UiO; Malherbe: OP; Heinzel: AsU*
• *Objectives (f)*

[189] Schmieder, B. and van Driel-Gesztelyi, L.: 2005, "Source Regions of Coronal Mass Ejections", in *IAU Symposium*, 149–160
• *Schmieder: OP & UiO; van Driel-Gesztelyi: OP*
• *Objectives (b)*

[190] Schwartz, P., Heinzel, P., Anzer, U., and Schmieder, B.: 2004a, "Determination of the 3D structure of an EUV-filament observed by SoHO/CDS, SoHO/SUMER and VTT/MSDP", *Astronomy & Astrophysics* **421**, 323–338
• *Schwartz, Heinzel: AsU; Schmieder: OP*
• *Objectives (b), (f)*

[191] Schwartz, P., Heinzel, P., and Schmieder, B.: 2005, "Non-Lte Modelling of the EUV Filament Based on Soho/sumer Observations of the Hydrogen Lyman Lines", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 97
• *Schwartz, Heinzel: ASU; Schmieder: OP*
• *Objectives (a), (b), (f)*

[192] Schwartz, P., Heinzel, P., and Schmieder, B.: 2007, "Importance of absorption and volume blocking for line intensity depression in EUV filaments", in B. Fleck and H. Lacoste (Eds.), *10 Years of SOHO and Beyond*, European Space Agency SP-617, in press
• *Schmieder: OP, Heinzel, Schwartz: AsU*
• *Objectives (a), (b), (e)*

[193] Schwartz, P., Heinzel, P., Schmieder, B., and Anzer, U.: 2006, "Study of an extended EUV filament using SoHO/SUMER observations of the hydrogen Lyman lines", *Astronomy & Astrophysics* **459**, 651–661
• *Schwartz, Heinzel: ASU; Schmieder: OP*
• *Objectives (a), (b), (f)*

[194] Schwartz, P., Schmieder, B., and Heinzel, P.: 2007, "NLTE diagnostics of a filament observed by SOHO/SUMER in hydrogen Lyman line series", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Schmieder: OP; Heinzel, Schwartz: AsU
• *Objective (a)*

[195] Schwartz, P., Schmieder, B., Heinzel, P., and Anzer, U.: 2004b, "Multiwavelength determination of the density and total mass of the EUV filament observed by SoHO/CDS, SoHO/SUMER and MSDP/VTT", in *IAU Symposium*, 219–222
• *Schwartz, Heinzel: AsU; Schmieder: OP & UiO*
• *Objectives (b), (c)*

[196] Sheminova, V. A., Rutten, R. J., and Rouppe van der Voort, L. H. M.: 2005, "The wings of Ca II H and K as solar fluxtube diagnostics", *Astronomy & Astrophysics* **437**, 1069–1080
• *Rouppe van der Voort: UiO Fellow; Rutten: UU & UiO*
• *Objectives (a), (c)*

[197] Siarkowski, M., Falewicz, R., and Berlicki, A.: 2006, "Small GOES flares with intense hard X-ray emission", *Advances in Space Research* **38**, 972–978
• *Berlicki: OP & UU Fellow*
• *Objectives (a), (b)*

[198] Sobotka, M., Bonet, J., Márquez, I., Muller, R., and Roudier, T.: 2004, "Motions of photospheric features in a sunspot moat", *Hvar Observatory Bulletin* **28**, 27–36
• *Bonet, Márquez: IAC; Sobotka: AsU*
• *Objective (a)*

[199] Sobotka, M. and Hanslmeier, A.: 2005, "Photometry of umbral dots", *Astronomy & Astrophysics* **442**, 323–329
• Sobotka: AsU
• *Objectives (a)*

[200] Sobotka, M. and Roudier, T.: 2007, "Horizontal motion in the vicinity of sunspots", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Sobotka: AsU
• *Objective (a)*

[201] Socas-Navarro, H., Trujillo Bueno, J., and Landi Degl'Innocenti, E.: 2004, "Signatures of Incomplete Paschen-Back Splitting in the Polarization Profiles of the He I λ10830 Multiplet", *Astrophysical Journal* **612**, 1175–1180
• *Trujillo Bueno: IAC ; Landi degl'Innocenti: OAA*
• *Objective (f)*

[202] Socas-Navarro, H., Trujillo Bueno, J., and Landi Degl'Innocenti, E.: 2005, "Polynomial Approximants for the Calculation of Polarization Profiles in the He I 10830 Å Multiplet", *ApJS* **160**, 312–317
• *Trujillo Bueno: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (d), (f)*

[203] Socas-Navarro, H., Trujillo Bueno, J., and Landi Degl'Innocenti, E.: 2006, "Polynomial Approximants for the Calculation of Polarization Profiles in the He I 10830 Å Multiplet (Revision)", *ApJS* **166**, 441–442
• *Trujillo Bueno: IAC; Landi Degl'Innocenti: OAA*
• *Objective (f)*

[204] Socas-Navarro, H., Martínez Pillet, V., Sobotka, M., Vázquez, M: 2004, "The thermal and magnetic structure of umbral dots from the inversion of high-resolution full Stokes observations", *Astrophysical Journal* in press (October)
• *Martínez Pillet, Vázquez: IAC; Sobotka: AsU*
• *Objectives (a), (d), (f)*

[205] Štepán, J., Heinzel, P., Kašparová, J., and Sahal-Bréchot, S.: 2006, "Polarization Diagnostics of Proton Beams in Solar Flares", *Cosmic Particle Acceleration, IAU Joint Discussion JD01, Prague, #55*
• Sahal-Bréchot: OP; Štepán, Heinzel, Kašparová: AsU
• *Objective (a)*

[206] Štepán, J., Heinzel, P., and Sahal-Bréchot, S.: 2007, "Impact polarization due to proton beams in solar flares", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Sahal-Bréchot: OP; Heinzel, Štepán: AsU
• *Objective (a)*

[207] Sýkora, J. and Rybák, J.: 2005, "Coronal manifestations of solar variability", *Advances in Space Research* **35**, 393–399
• *Sýkora, Rybák: AISAS*
• *Objective (b)*

[208] Temmer, M., Rybák, J., Bendik, P., Veronig, A., Vogler, F., , Pötzi, W., Otruba, W., and Hanslmeier, A.: 2006a, "Hemispheric Sunspot Numbers 1945–2004: data merging from two observatories", *Central European Astrophysical Bulletin* **30**, 65–73
• *Rybák: AISAS*
• *Objective (b)*

[209] Temmer, M., Rybák, J., Bendik, P., Veronig, A., Vogler, F., Otruba, W., Potzi, W., and Hanslmeier, A.: 2006b, "Hemispheric sunspot numbers Rn and Rs from 1945-2004: catalogue and N-S asymmetry analysis for solar cycles 18-23", *Astronomy & Astrophysics* **447**, 735–743
• *Rybák: AISAS*
• *Objective (b)*

[210] Temmer, M., Rybák, J., Veronig, A., Bendík, P., Vogler, F., Pötzi, W., Otruba, W., and Hanslmeier, A.: 2005, "Hemispheric Sunspot Numbers RN and RS from 1945-2004: Extended and Improved Catalogue", in D. Danesy, S. Poedts, A. D. Groof, and J. Andries (Eds.), *The Dynamic Sun: Challenges for Theory and Observations*, European Space Agency SP-600, 52–55
• *Rybák: AISAS*
• *Objective (b)*

[211] Temmer, M., Rybák, J., Veronig, A., and Hanslmeier, A.: 2005, "What causes the 24-day period observed in solar flares?", *Astronomy & Astrophysics* **433**, 707–712
• *Rybák: AISAS*
• *Objective (b)*

[212] Temmer, M., Veronig, A., Rybák, J., Brajša, R., and Hanslmeier, A.: 2004a, "Importance of magnetically complex active regions on solar flare occurence", *Hvar Observatory Bulletin* **28**, 95–102
• *Rybák: AISAS*
• *Objective (b)*

[213] Temmer, M., Veronig, A., Rybák, J., Brajša, R., and Hanslmeier, A.: 2004b, "On the 24-day period observed in solar flare occurrence", *Solar Physics* **221**, 325–335
• *Rybák : AISAS*
• *Objective (b)*

[214] Temmer, M., Veronig, A., Rybák, J., Brajša, R., and Hanslmeier, A.: 2006c, "Periodical patterns in major flare occurrence and their relation to magnetically complex active regions", *Advances in Space Research* **38**, 886–890
• *Rybák: AISAS*
• *Objective (b)*

[215] Temmer, M., Veronig, A., Rybak, J., and Hanslmeier, A.: 2003, "On Rotational Patterns of the Solar Magnetic Field", in *Solar Variability as an Input to the Earth's Environment*, Procs. of ISCS 2003 Symposium, ESA SP-535, ESA Publ. Div., ESTEC, Noordwijk, 157–160
• *Rybak: AISAS*
• *Objective (a)*

[216] Tomasz, F.: 2006, *Eruptive events in the outer atmosphere of the quiet Sun*, Ph.D. Thesis, Comenius University, Bratislava
• *Tomasz: AISAS*
• *Objective (c)*

[217] Tomasz, F., Régnier, S., Schwartz, P., Rybák, J., Kučera, A., Heinzel, P., Curdt, W., and Wöhl, H.: 2006, "Study of a small-scale eruptive event observed by SOHO/SUMER", in H. Lacoste (Ed.), *SOHO17 - 10 years of SOHO and Beyond*, European Space Agency SP-617
• *Tomasz, Rybák, Kučera: AISAS, Régnier: ESA fellow, Schwartz, Heinzel: AsU*
• *Objective (b)*

[218] Tomasz, F., Rybák, J., Kucera, A., Curdt, W., and Wöhl, H.: 2004, "SUMER/SOHO and TRACE Study of the Transition Region Blinker", in *Proceedings SOHO 13 Workshop*, ESA Special Publication SP-547,

307–310
• *Tomasz, Rybák, Kučera: AISAS*
• *Objectives (b), (c)*

[219] Tomasz, F., Rybák, J., Kučera, A., Curdt, W., and Wöhl, H.: 2005a, "Influence of Transition Region Blinker on the Surrounding Chromospheric and Coronal Plasma", *Hvar Observatory Bulletin* **29**, 197–204
• *Tomasz, Rybák, Kučera: AISAS*
• *Objective (c)*

[220] Tomasz, F., Rybák, J., Kučera, A., Curdt, W., and Wöhl, H.: 2005b, "On the behaviour of a blinker in chromospheric and transition region layers", in *Solar Magnetic Phenomena, Astrophysics Space Science Library, vol. 320, Springer*, 207–210
• *Tomasz, Rybák, Kučera: AISAS*
• *Objective (c)*

[221] Trujillo Bueno, J., Landi Degl'Innocenti, E., Casini, R., and Martínez Pillet, V.: 2005a, "The Scientific Case for Quantum Spectropolarimetry from Space", in D. E. Innes, A. Lagg, and S. A. Solanki (Eds.), *Chromospheric and Coronal Magnetic Fields*, European Space Agency SP-596
• *Trujillo Bueno, Martínez Pillet: IAC; Landi Degl'Innocenti: OAA*
• *Objective (d)*

[222] Trujillo Bueno, J., Merenda, L., Centeno, R., Collados, M., and Landi Degl'Innocenti, E.: 2005b, "The Hanle and Zeeman Effects in Solar Spicules: A Novel Diagnostic Window on Chromospheric Magnetism", *Astrophysical Journal Letters* **619**, L191–L194
• *Merenda: IAC Fellow; Trujillo Bueno, Collados, Centeno: IAC; Landi Degl'Innocenti: OAA*
• *Objectives (a), (f)*

[223] Trujillo Bueno, J., Shchukina, N., and Asensio Ramos, A.: 2004, "A Substantial Amount of Hidden Magnetic Energy in the Quiet Sun", *Nature* **430**, 326–329
• *Trujillo Bueno: IAC; Asensio Ramos: OAA Fellow*
• *Objectives (a), (c), (d), (f)*

[224] Tsiropoula, G. and Tziotziou, K.: 2004, "The role of chromospheric mottles in the mass balance and heating of the solar atmosphere", *Astronomy & Astrophysics* **424**, 279–288
• *Tziotziou: UU Fellow*
• *Objectives (a), (b), (f)*

[225] Tziotziou, K. and Mein, P.: 2003, "Line profile inversions developed for MSDP data", in *THEMIS Workshop*, Procs. of THEMIS Workshop, Observatoire Midi Pyrénées, Toulouse, France, 161–166
• *Tziotziou: UU Fellow; Mein: OP*
• *Objectives (f)*

[226] Tziotziou, K. and Tsiropoula, G.: 2002, "The role of chromospheric mottles in the mass balance and heating of the solar atmosphere", in *Solar Variability: From Core to Outer Frontiers*, Procs. of 10th European Solar Physisc Meeting, ESA SP-506, ESA Publ. Div., ESTEC, Noordwijk, 787–790
• *Tziotziou: UU Fellow*
• *Objectives (a), (c), (f)*

[227] Tziotziou, K. and Tsiropoula, G.: 2004, "Mass and Energy Supply of Fine Structure to the Solar Corona", in *IAU Symposium 219*, 123–129
• *Tziotziou: UU Fellow*
• *Objectives (a), (b)*

[228] Tziotziou, K., Tsiropoula, G., and Mein, P.: 2003, "On the nature of the chromospheric fine structure. I. Dynamics of dark mottles and grains", *Astronomy and Astrophysics* **402**, 361–372
• *Tziotziou: UU Fellow; Mein: OP*
• *Objectives (a), (b), (f)*

[229] Tziotziou, K., Tsiropoula, G., and Mein, P.: 2004, "On the nature of the chromospheric fine structure. II. Intensity and velocity oscillations of dark mottles and grains", *Astronomy & Astrophysics* **423**, 1133–1146
• *Tziotziou: UU Fellow; Mein: OP*
• *Objectives (a), (b), (f)*

[230] Tziotziou, K., Tsiropoula, G., and Sütterlin, P.: 2005, "DOT tomography of the solar atmosphere V. Analysis of a surge from AR10486", *Astronomy & Astrophysics* **444**, 265–274
• *Tziotziou: UU Fellow; Sütterlin: UU*
• *Objectives (a), (b), (c)*

[231] van Noort, M., Rouppe van der Voort, L., and Löfdahl, M. G.: 2005, "Solar Image Restoration By Use Of Multi-frame Blind De-convolution With Multiple Objects And Phase Diversity", *Solar Physics* **228**, 191–215
• *Rouppe van der Voort: UiO Fellow; van Noort: UiO; Löfdahl: KVA*
• *Objectives (d)*

[232] van Noort, M. J. and Rouppe van der Voort, L. H. M.: 2006, "High-Resolution Observations of Fast Events in the Solar Chromosphere", *Astrophysical Journal Letters* **648**, L67–L70
• *van Noort: UiO & KVA; Rouppe van der Voort: UiO Fellow*
• *Objectives (a), (b), (c)*

[233] Varady, M., Karlický, M., and Kašparová, J.: 2007, "Return current and the energy deposit in flares", in P. Heinzel, I. Dorotovič, and R. J. Rutten (Eds.), *The Physics of Chromospheric Plasmas*, Astronomical Society Pacific Conference Series, in press
• Kašparová, Karlický: AsU
• *Objective (b)*

[234] Vecchio, A., Cauzzi, G., Reardon, K. P., Janssen, K., and Rimmele, T.: 2007, "Solar Atmospheric Oscillations and the Chromospheric Magnetic Topology", *Astronomy & Astrophysics* **461**, L1–L4
• *Janssen: OAA Fellow; Vecchio, Cauzzi, Reardon: OAA*
• *Objectives (a), (c)*