# ESMN / EUROPEAN SOLAR PHYSICS RESEARCH AREA

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ABSTRACT

I briefly present the *European Solar Magnetometry Network* as a contemporary example of solar physics collaboration across European borders, and I place it in larger-scale context by discussing the past and future of Europe-wide solar physics organization. Solar physics from space is inherently transnational but overall solar physics needs more European cohesion to gain most from EC policy trends towards "European research areas".

Keywords: solar physics, European research, European Commission

## 1. PRESENT: ESMN & PLATON

I start this contribution by summarizing the two EC-TMR networks that presently address solar physics. Their efforts are interesting in themseleves but I describe them here primarily to paint the European solar physics scene as increasingly Brussels-directed.

### 1.1 ESMN

ESMN stands for *European Solar Magnetometry Network* and denotes a collaboration of eight European solar physics research groups funded by a grant from the TMR programme of the European Commission during May 1, 1998 — April 30, 2002. The partners are:

- Sterrekundig Instituut Utrecht
- IAC, La Laguna
- OAC, Naples
- Institute of Theoretical Astrophysics, Oslo
- Research Station for Astrophysics, Stockholm
- Astrophysikalisches Institut, Potsdam
- DASOP, Meudon
- ESA Space Science Department, Noordwijk

and the mission statement is "to integrate the development and usage of the European solar telescopes on the Canary Islands (Fig. 1) with space observation and data interpretation and theoretical analysis". As its name indicates, the ESMN concentrates on solar magnetometry, but in a broad sense.

The size and constitution of the ESMN are, as for any TMR network, strongly dictated by the rules of the game, *i.e.*, the EC program constraints. These required[1] that a TMR bid proposed to divide a limited amount (1.5 Meuro maximum) during four years over a maximum number of groups from a maximum number of EC nations including "less favored regions", and do so in the form of postdoc salaries and inter-partner travel. No money for computers or other hardware.

Accordingly, the main part of the ESMN grant goes to hiring young solar physicisists. During 1999 most groups appointed ESMN postdocs for 2–3 year duration, specifically Peter Sütterlin (Utrecht), Olaf Dittmann (IAC), Etienne Vogt (OAC), Colin Rosenthal (Oslo), Bertil Dorch (Stockholm), Karin Muglach (Potsdam) and Kostas Tziotziou (Meudon). Later, Eoghan O'Shea was appointed as postdoc at Estec, Boris Gudiksen as graduate student at Stockholm, and Jack Ireland as postdoc and Carla Gil as masters student at the OAC[2].

The activities of the ESMN are quite varied, ranging from telescope design and building to theory and simulation. The red thread is indeed the use of the Canary Island solar telescopes and SOHO, with sunspot dynamics, spectropolarimetry, and numerical wave simulations presently getting most emphasis and the SVST ⇒ NSST retrofit the most amazing feat. Full information is available on the ESMN website[3] including the yearly reports and mid-term report to the EC. Bertil Dorch also maintains an outreach-oriented ESMN website[4].

A major ESMN activity is the organization of summer/winter schools. The first one was "Radiative Transfer and Radiation Hydrodynamics" in Oslo during June 1999. The second became a full-fledged Canary Islands Winter School last November, "Astrophysical Spectropolarimetry". I envisage to organize "Solar Magnetism" sometime soon, probably together with PLATON.

### 1.2 PLATON

PLATON is a complementary EC-TMR network on plasma astrophysics theory that is funded for August 1, 2000 – July 31, 2004. Its major topics are coronal

[1] Past tense, the last TMR proprosal deadline was just before this meeting. The ESMN proposed a 2002 – 2006 rebirth as the "European Solar Magnetism Network".

[2] There are still slots available until April 30, 2002 at both postdoc and masters/graduate student level — contact me if you qualify (EC national below 35 years) and are interested!

[3] http://www.astro.uu.nl/~rutten/tmr

[4] http://www.astro.su.se/~dorch/esmn

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heating, flares and wind generation, not only solar but also for other stars and accretion disks. Like the ESMN it comprises eight groups:

- School of Mathematics, St. Andrews
- Institute for Plasma Physics, Nieuwegein
- Center for Plasma Astrophysics, Leuven
- Astronomical Observatory, Strasbourg
- IAC, La Laguna
- Ruhr Universität, Bochum
- Astrophysikalisches Institut, Potsdam
- University of Crete, Heraklion

and it has hired three graduate students and two postdocs sofar; the remaining vacancies are listed on the PLATON website[5]. The PLATON coordinator, Thomas Neukirch, edits a newsletter that you may inspect at the website too. His introduction to the first issue illustrates EC constraints to TMR network activities very well.

## 2. PAST: JOSO & LEST

This section reviews ESMN precursor history in the form of the European collaborations that led to the establishment of the Canary Island telescopes. It is condensed out of a C. Zwaan obituary in the 1999 JOSO Annual Report (Rutten 2000).

K.O Kiepenheuer started JOSO in 1969 with a three-item to-do list:

*(i)* Find the best location for optical solar observations in or near Europe;

*(ii)* Move existing telescopes to that site and erect new national facilities there;

*(iii)* Build a large international solar telescope there.

Item *(i)* constituted JOSO's primary activity. Working Group I "Site Testing" chaired by Zwaan inspected forty likely and less likely sites and tested a dozen sites for some weeks at least. The story is laid down in JOSO Reports SIT4, SIT5, SIT6, MET9, MET14, MET16, MET18, MET25, MET31, MET49, MET54, MET59, OPT7, SIT20, SIT26 and many JOSO Annual Reports. In the end, the 1979 German comparison between Roque de los Muchachos and Izaña led to preference for the latter site (see JOSO Report 1980/1 by Brandt & Wöhl and the more accessible publications of Brandt and Wöhl 1982 and Brandt and Righini 1985). Later, the LEST Foundation declared La Palma better without comparative testing. (And I wonder whether the issue will re-emerge in ATST siting.)

JOSO's to-do item *(ii)* led to the planned move of the GCT, now to become GREGOR, the long-planned installation of the VTT, the long-planned installation of THEMIS and DOT whose completion took even longer, and the unexpected but very fast installation of Scharmer's SVST, now being revamped into the NSST at even greater speed.

JOSO's to-do item *(iii)* later developed into and split off as the ill-fated LEST Foundation, officially buried three years ago and leaving stacks of reports plus a hole in the ground on La Palma large enough to bury them in.

The space counterpart to LEST was the equally ill-fated US project for a major orbiting solar observatory called SOT, HRSO and OSL in its various incarnations. The driving force was the Lockheed group under Alan Title. The present successes of MDI on SOHO and of TRACE as well as the great promise of NASA's SDO attest to his perseverance. On the ground, the ATST project is effectively a LEST reincarnation but with the initiative shifted from Europe to the US. In the meantime, Europe is back to JOSO phase *(ii)* in the form of upgrades of national telescopes (NSST, GREGOR, THEMIS).

Zwaan's sharing in the JOSO site testing campaigns and their truly international character inspired him in 1974 to be a driving force behind ESMOC, the "European Solar Meeting Organization Committee" which set up the First European Solar Physics Meeting at Florence in 1975, combining JOSO and CESRA, and there initiated the start of the Solar Physics Section of the EPS which later became a section of the EAS as well and has organized similar meetings every three years (Toulouse 1978, Oxford 1981, Noordwijkerhout 1984, Titisee 1987, Debrecen 1990, Catania 1993, Saloniki 1996, Florence 1999, Prague 2002). Even though the SPS doesn't do much else, these conferences make it the most active section of the EAS and of the EPS astrophysics division.

## 3. FUTURE: SOLAR RESEARCH AREA

The eight ESMN groups together represent a sizable part of groundbased European solar physics but obviously incompletely, as dictated by the stringent EC-imposed format. Glaring absentees are the Kiepenheuer Institute and the Göttingen, Zürich, Toulouse (Pic du Midi), Arcetri, Sicilian and Greek solar physics groups within the EC, and now that the EC widens its borders to prospective new members (presently called Associated States in the EC 5th Framework program), the solar physics groups in Poland, the Czech Republic, Slovakia, and Hungary. A network tying groundbased European solar physiscs together should have about two dozen partner groups.

In addition, there is no clear distinction between groundbased and spacebased solar physics. The ESMN is strongly oriented to the Canary Island telescopes but also a large user of SOHO and TRACE. Adding space-oriented groups (Lindau, Orsay, Culham, Ukkel etc) would bring the group total to about

[5] http://www-solar.mcs.st-and.ac.uk/~thomas/platon

*Figure 1: Portrait gallery of European groundbased solar telescopes at the Canary Islands in order of ascending aperture. From left to right:*
• *DOT (Dutch Open Telescope), La Palma, aperture 45 cm. The open design minimises disturbance of the excellent atmospheric conditions at La Palma. Suited to high-resolution imaging. A large-volume five-wavelength speckle pipeline system is being installed. Website: dot.astro.uu.nl.*
• *GCT (German Gregory Coudé Telescope), Tenerife, aperture 45 cm. Vacuum reflector that is especially suited to spectrographic magnetometry. It will be rebuilt into the open 1.5 m GREGOR reflector. Website: www.uni-sw.gwdg.de/research/exp_solar/GCT_text.html.*
• *VTT (German Vacuum Tower Telescope), Tenerife, aperture 70 cm. General-purpose solar telescope with extensive post-focus equipment for imaging and spectrometry. A low-order adaptive optics system saw first light recently. Website: www.kis.uni-freiburg.de/kiswwwe.html.*
• *THEMIS (French-Italian Télescope Héliographique pour l'Etude du Magnétisme et des Instabilités Solaires), Tenerife, aperture 90 cm. Postfocus equipment includes an elaborate spectrometer designed for multi-line Stokes vector magnetometry and MSDP (Multichannel Subtractive Double Pass) 2D spectrometry with magnetographic capability, and the Italian Panoramic Monochromator which will be replaced by the IBIS interferometer the coming years. Website: www.themis.iac.es.*
• *NSST (New Swedish Solar Telescope), La Palma, aperture 96 cm. The successor to the SVST (Swedish Vacuum Solar Telescope), expected to be operational from 2001 onwards. Vacuum refractor with adaptive optics that is likely to provide 0.1 arcsec resolution consistently. Website: www.astro.su.se/groups/solar.*

thirty. Complete solar physics coverage would then add theory-oriented groups (including the PLATON teams) as well.

So — the "European solar physics research area" encompasses roughly 40 groups. This is EC jargon for the very near future. Simply put, the EC wants fewer and larger customers, a common strategy for bureaucratic organizations aiming to maintain control = power and influence. The 6th EC Framework program will differ considerably from what we have now and strive to (in EC parlance):

- optimise European level infrastructures
- establish networking centres of excellence
- establish virtual centres and maximize electronic networks
- produce more consistent use of public instruments and resources
- have more coordinated implementation,

next to the obvious politically correct goals:

- more mobility
- more women
- stimulate science career choices
- stimulate European science careers
- integrate Eastern Europe
- enhance European attractivity to scientists from abroad,

and these goals set the trends and scene to which European solar physics must conform to get funded.

Parent birds preferentially feed those fledgelings that open beaks widest, scream loudest, have the brightest throat marks, shake wings most frantic — because their own parental genes are biologically coded for long-term survival. Any money-dispensing authority in the EC is politically coded to support those endeavours that promise most advertisable successes, feathers in their cap. In this feeding dance the EC calls the steps; we have to shake and scream and paint our throats the way they like it. Hard-coded facts of life that lead to hard questions. In parlance: how to strategize priorities, facilitate empowerment, implement visioning? In plainer language: who does what where to maximize our take?

## 4. WHO, WHAT, WHERE?

### 4.1 WHERE?

The third question is easiest: all of the forty-odd groups inventorized above should together constitute the European solar physics research area and should encompass all European solar physics, from the ground and from space (and from the stratosphere when long-duration ballooning finally takes off) and in computers as well. Adding solar wind and

space weather research enlarges the area yet further.

### 4.2 WHAT?

A harder question. Obvious desires are to improve groundbased observing, spacebased observing and computerbased observing in our field, but that sounds as more of the same and not as 6th Framework sexy. It seems to me that the virtual solar observatory and electronic networking are key strategems to consider. Virtual observatories are going to be both valuable and fashionable. In our field, the utterly dynamic nature of our subject makes time dependency a special need and hence an asset. Getting the Canary Island telescopes fully on-line could be part of the package. There is lots of EC money from other budgets than science going to such activities already — *e.g.*, Dynacore[6] which spent a sizable amount to establish the obvious fact that the internet bandwidth to Tenerife is presently too low for tele-running telescopes from the continent. We might grab a piece of this rich cake for ourselves.

Space weather is a strong motivation for electronic networking. NASA's "Living with a Star" program including the Solar Dynamics Observatory with its enormous data rate will set the standard in on-line observing. It is disconcerting that efforts towards a virtual solar observatory are well underway in the US with nothing seriously on the horizon here. Perhaps we may sit back and wait for our American colleagues to fill the worldwide need, as they did with SolarNews and ADS, but we might also try to use the intrinsic and unquestionable need for virtual solar observing and the existence of the Canary Island telescopes as a lever into 6th Framework and other EC funds and as a driver to pull our act together.

It is also disconcerting that Solar Orbiter does not fit the EC policy trends very well. It is surely sexy and scientifically worthwhile to get close to the sun and leave the ecliptic, but the mission isn't one that calls for much data diffusion and large-scale virtual networking. In ten years our laptops (pocket rolls or headsets by then, or virtual themselves) will easily harbor all of Solar Orbiter's data in a puny memory device. "Optimising European infrastructure" and "establishing networking centres of excellence" etcetera the coming years seems to need other solar physics drivers than Solar Orbiter even though the latter will be our flagship mission in space in the more distant future.

### 4.3 WHO?

The hardest question. In its site-testing heydays, JOSO was perhaps the most successful collaborative enterprise European solar physics has known. It was largely inspired by K.O. Kiepenheuer's drive for better observing and it functioned very well because the deliverable ("the best site in Europe") was well defined. At present, the consortia that make up space missions are well organised, also with well-defined deliverables, but the rest of European solar physics is essentially non-organized these days. The EPS/EAS Solar Physics Section is a potential candidate to generate European coherency but limits its duties to organizing one Euroconference every three years, with the need for yearly Euroconferences in intervening years presently being filled by JOSO, largely thanks to Brigitte Schmieder. The other JOSO activities are marginal, CESRA remains a splinter group around Arnold Benz, the two TMR networks discussed above are too small and ephemeral. Perhaps we need a European Solar Observatory[7] before we corner a virtual one.

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*Disclaimer.* The opinions expressed above are not official ESMN ones. And subject to change without notice.

## REFERENCES

Brandt, P. N. and Righini, A.: 1985, "The JOSO site testing campaigns in the Canary Islands", *Vistas in Astronomy* **28**, 437–448

Brandt, P. N. and Wöhl, H.: 1982, "Solar site-testing campaign of JOSO on the Canary Islands in 1979", *Astron. Astrophys.* **109**, 77–89

Rutten, R. J.: 2000, "C. Zwaan (1929—1999) and JOSO", in A. Antalová and A. Kučera (Eds.), *Annual Report 1999 Volume 29*, Joint Organization for Solar Observations, Astron. Inst. Tatranská Lomnica, Slovak Republic, 4–7

[6] http://www.phys.uu.nl/~dynacore

[7] Or a European Solar Research Organization, since ESRO is a non-taken abbreviation at present.