SOTERIA

Giovanni Lapenta for the Soteria Consortium

Centrum voor Plasma-Astrofysica

Katholieke Universiteit Leuven

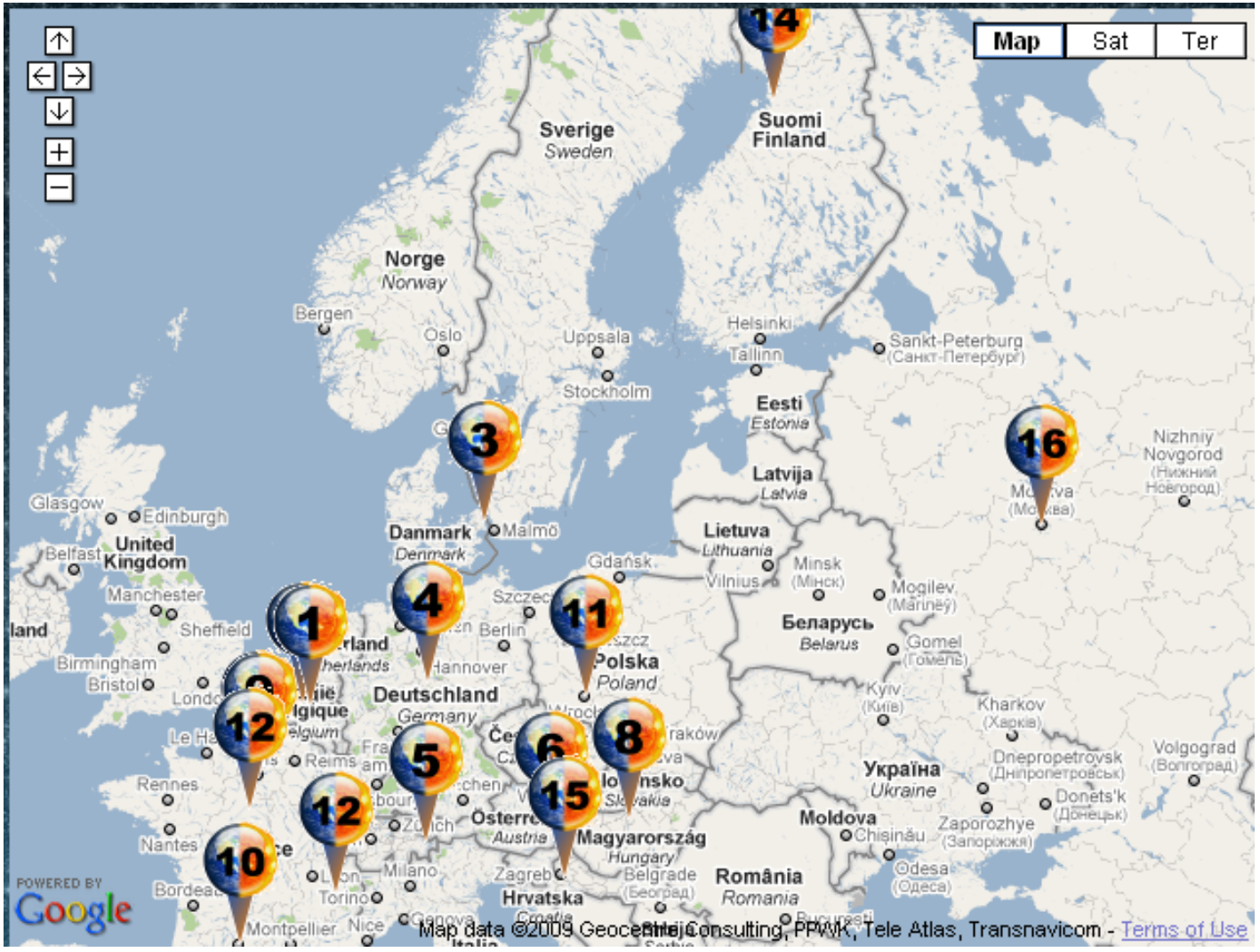
BELGIUM

This research has received funding from the European Commission's Seventh Framework Programme (FP7/2007-2013) under the grant agreement n° 218816 (SOTERIA project, www.soteria-space.eu). .

Outiline

- Overview of the project
- Overview of the progress
- Future events

Map of Soteria



SOTERIA EC network funded by the EC/FP7

- Coordinator: G. Lapenta
- Data (ground & space) and simulation on:

1. **Photosphere**
2. **Chromosphere/Corona**
3. **Heliosphere/Terrestrial effects**
4. **Irradiance**

- Focus on data dissemination
- Looking forward to collaborations outside the consortium

Participant Number	Participant short name	Participant organisation name	Country
1 (coordinator)	KU Leuven	Katholieke Universiteit Leuven	Belgium
2	UNIGRAZ	Universitaet Graz	Austria
3	PMOD-WRC	Pyhsikalisch-Meteoroligisches Observatorium Davos and World Radiation Center	Switzerland
4	KO	Konkoly Observatory	Hungary
5	CNRS LPCE & LP	Centre National de la Recherche Scientifique	France
6	ROB/SIDC	Koninklijke Sterrenwacht van Belgie	Belgium
7	OBSPARIS	Observatoire de Paris	France
8	SRC-PAS	Space Research Centre, Polish Academy of Sciences	Poland
9	MTA-KFKI-RMKI	MTA-KFKI-RMKI Research Institute for Particle and Nuclear Physics	Hungary
10	DTU	Technical University of Denmark	Denmark
11	UOulu	University of Oulu	Finland
12	UGOE	Georg-August-Universität Göttingen Stiftung Öffentlichen Rechts	Germany
13	HVAR	Hvar Observatory, Faculty of Geodesy, University of Zagreb	Croatia
14	NOVELTIS	Noveltis Sas	France
15	FIAN	P.N. Lebedev Physical Institute	Russia
16	IEEA	Informatique Electromagnetisme Electronique Analyse numérique	France

SEVENTH FRAMEWORK PROGRAMME

Overview of the Space Covered by Soteria

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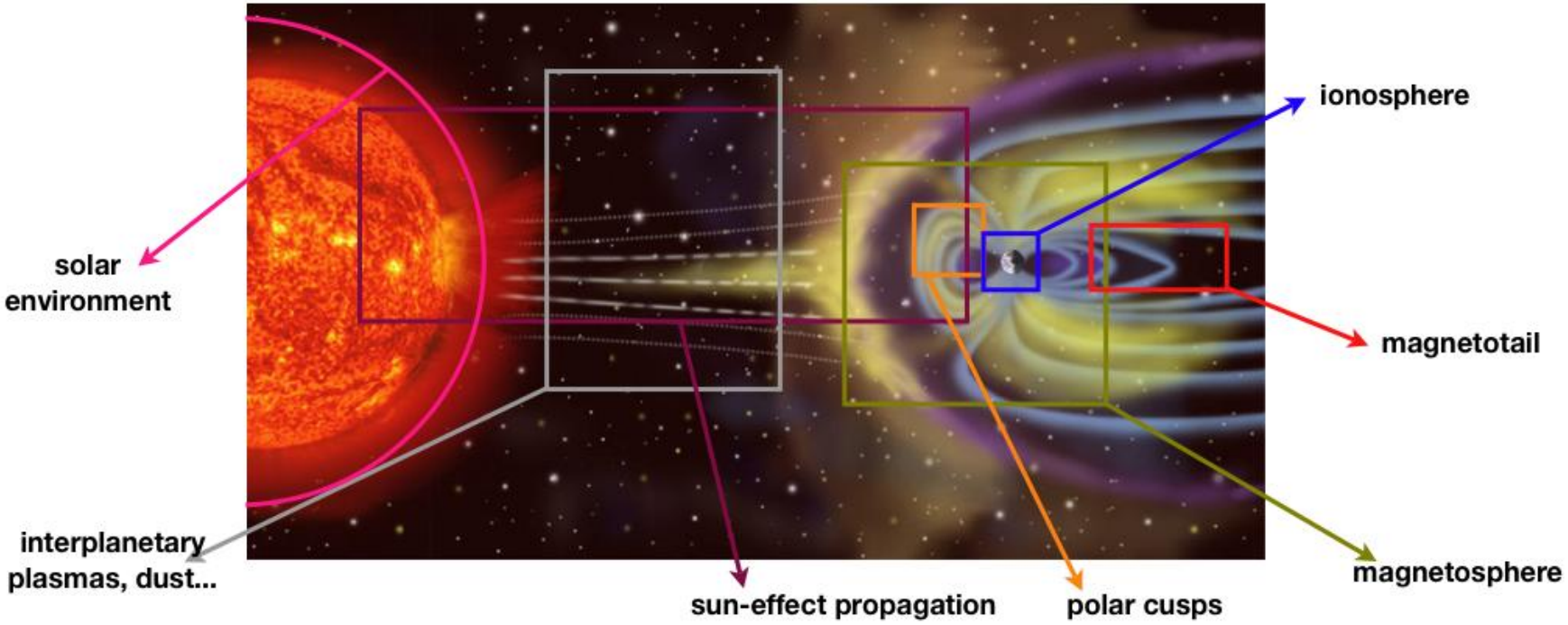
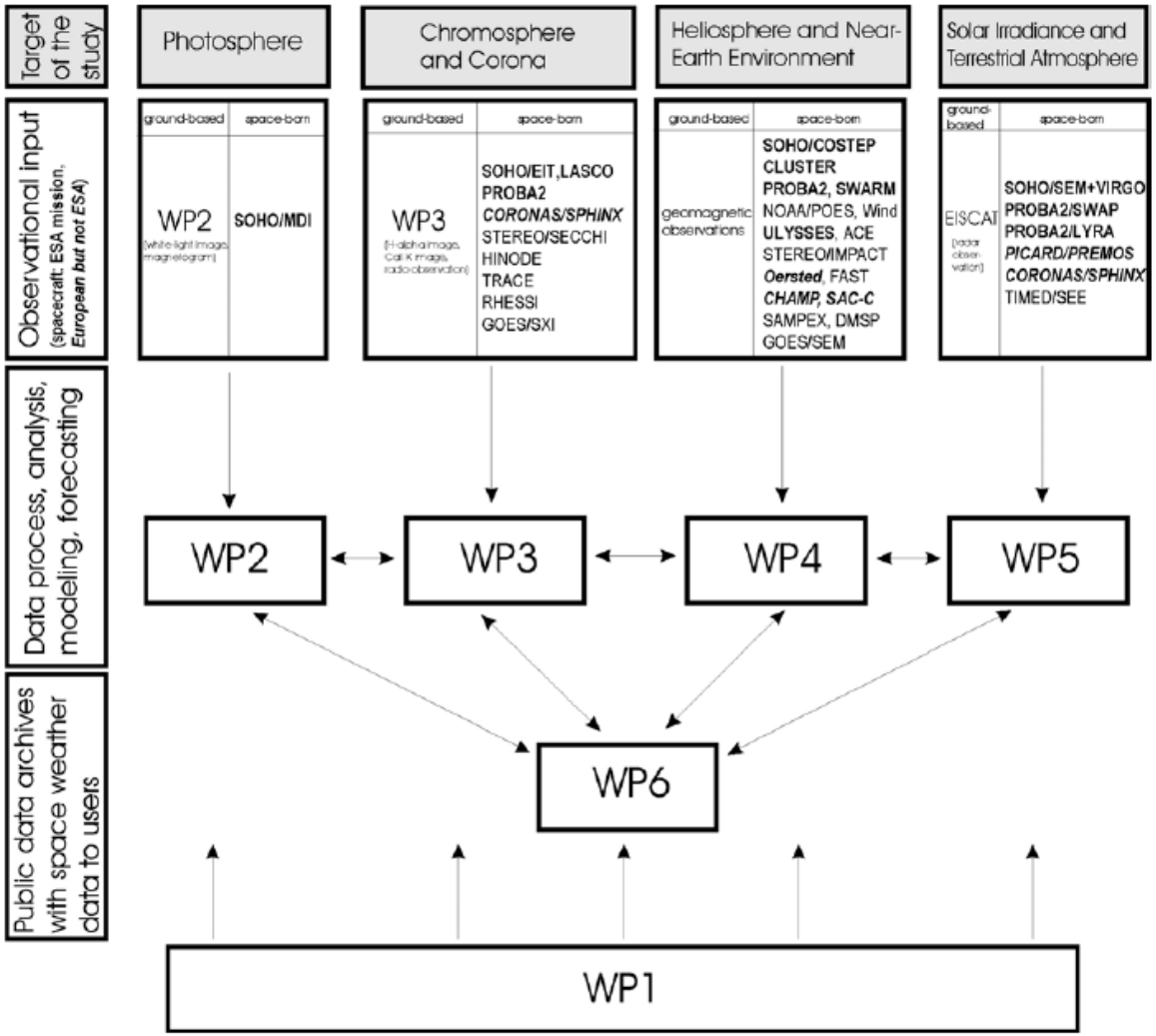
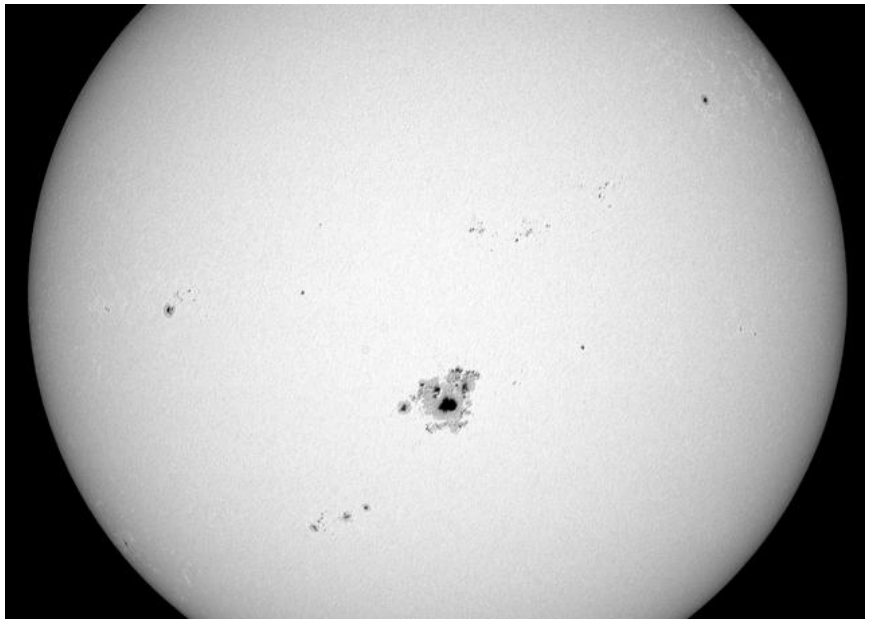


WP1: Management
Goals of the project



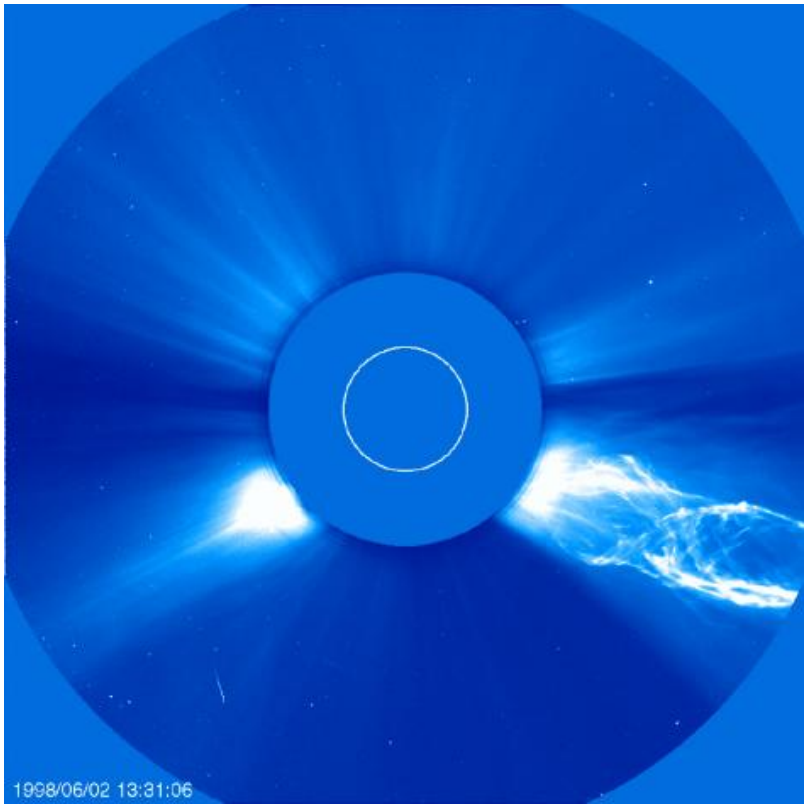
WP2: Photosphere



Major sunspot group passing central meridian: this image shows an active Sun, only two years after the last maximum of activity, with a major sunspot group passing central meridian. This whole-disk CCD image was taken on Aug. 17, 2002 with the Uccle solar telescopes (ROB, Brussels), one of the ground-based synoptic instruments that will support Work Package 2 of the SOTERIA project.

- Relevance to space weather:
  - Active regions
  - Sunspot size, position, polarities and trends
  - Emerged field structures
  - Unstable configurations and current layers
  - Magnetic reconnection and initiation of CMEs
- Relevance to irradiance (weather, climate)
  - Positive: faculae
  - Negative: sunspots

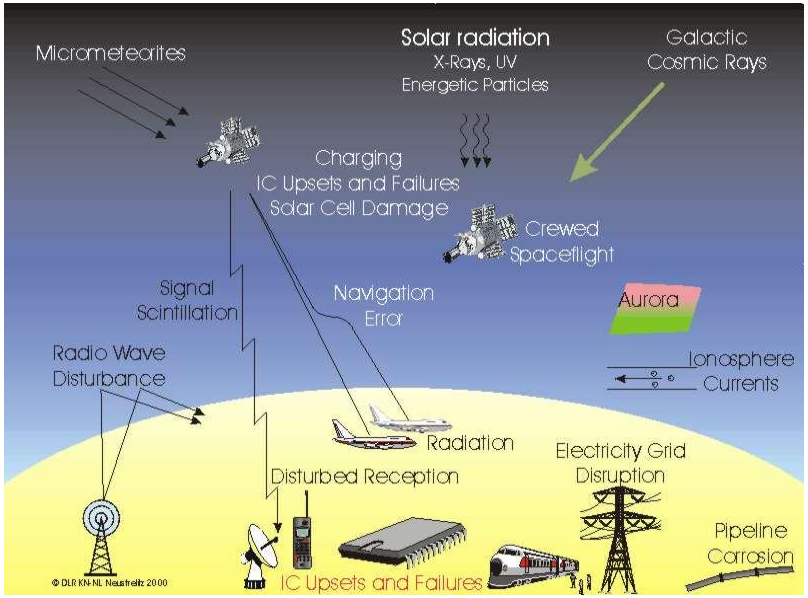
WP3: Chromosphere and corona

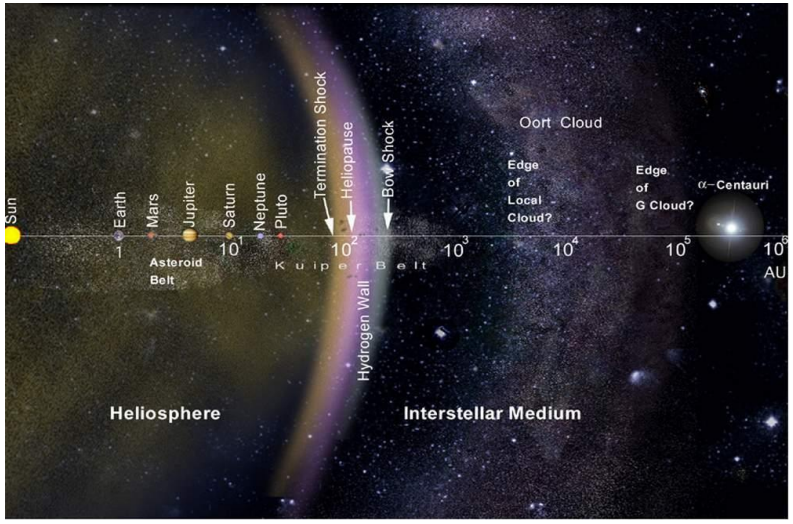


Focus on:

- Flares
- CMEs
- Coronal heating
- Wind creation in coronal holes (fast)
- Wind creation in helmet streamers (slow)
- Constraining models with observations

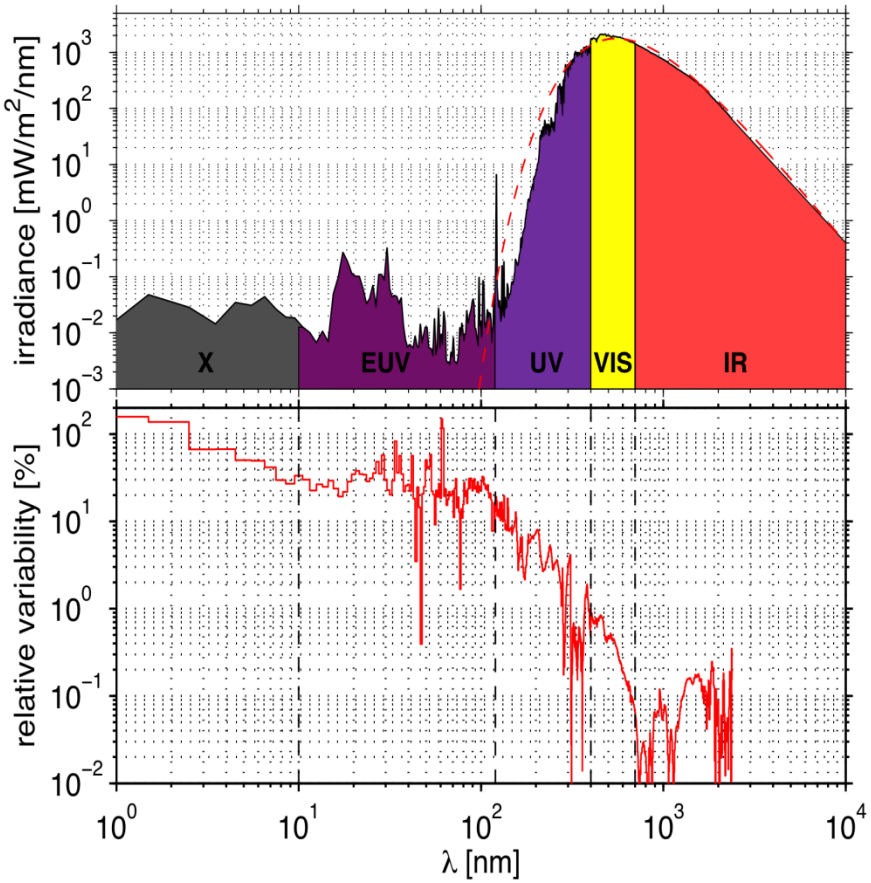
WP4: Heliosphere and Terrestrial Effects





- Solar effects on the Earth, other planets, human activities
- Energetic particles streaming from the Sun
- Magnetic storms
- Variability and interactions with magnotospheres
- Processes initiated in the magnetospheres (e.g. substorms)

WP5 *Irradiance*: Background



How does the **solar irradiance** vary in the EUV-UV-visible range ?

What causes the irradiance to change on short (days) to long (years) time scales ?

How does this affect the upper terrestrial atmosphere ?

WP6: Distribution of data and dissemination

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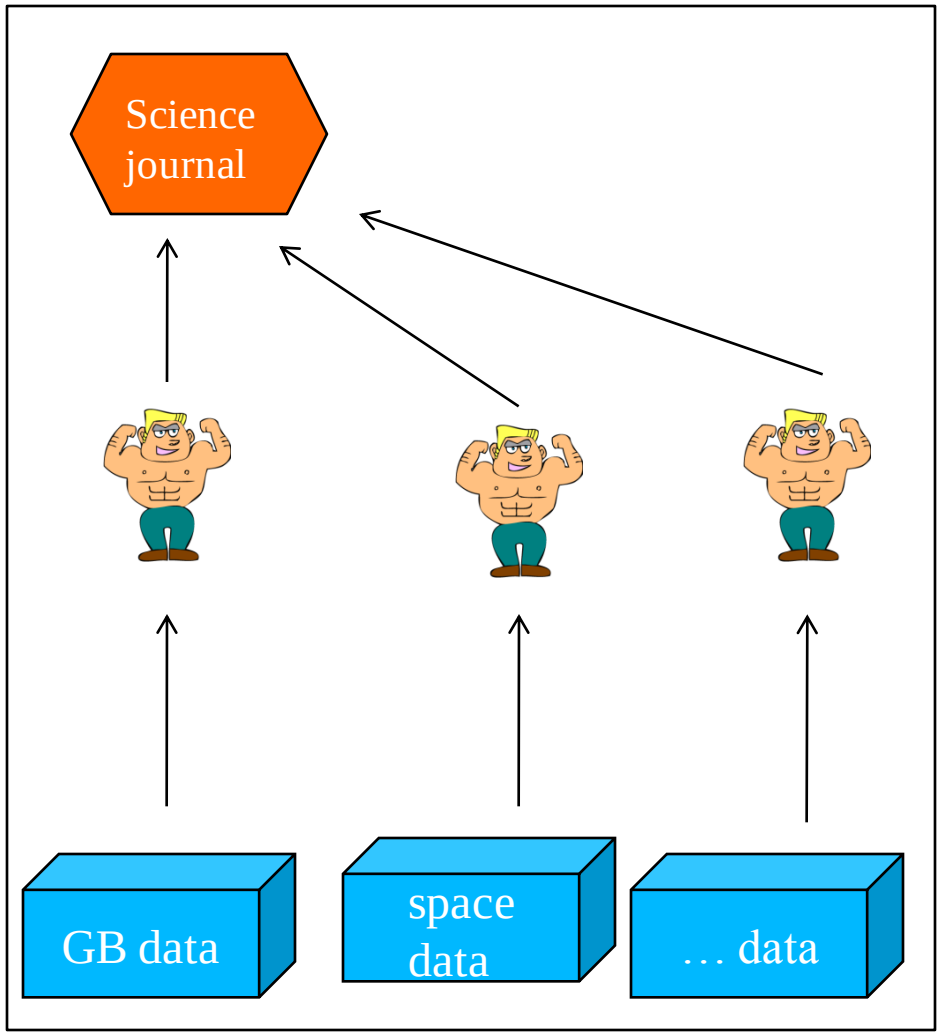
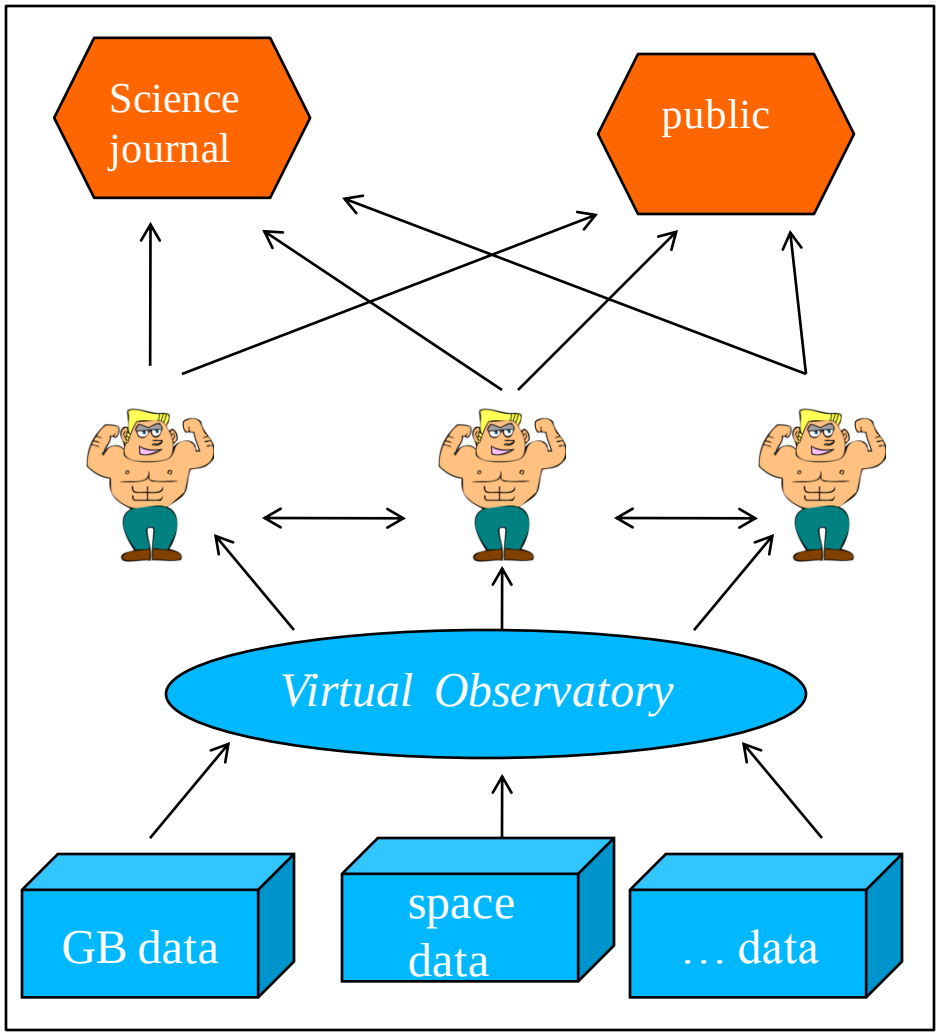
BEFORE SOTERIA



SOTERIA



Overview of the progress of each WP

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WP1: Management (Lapenta)

WP2: Photosphere: Dr. – Ludmany

WP3: Chromosphere and Corona: Dr. Bothmer

WP4: Heliosphere and Terrestrial Effects: Dr. Vennerstrom

WP5: Irradiance: Dr. Dudok de Wit

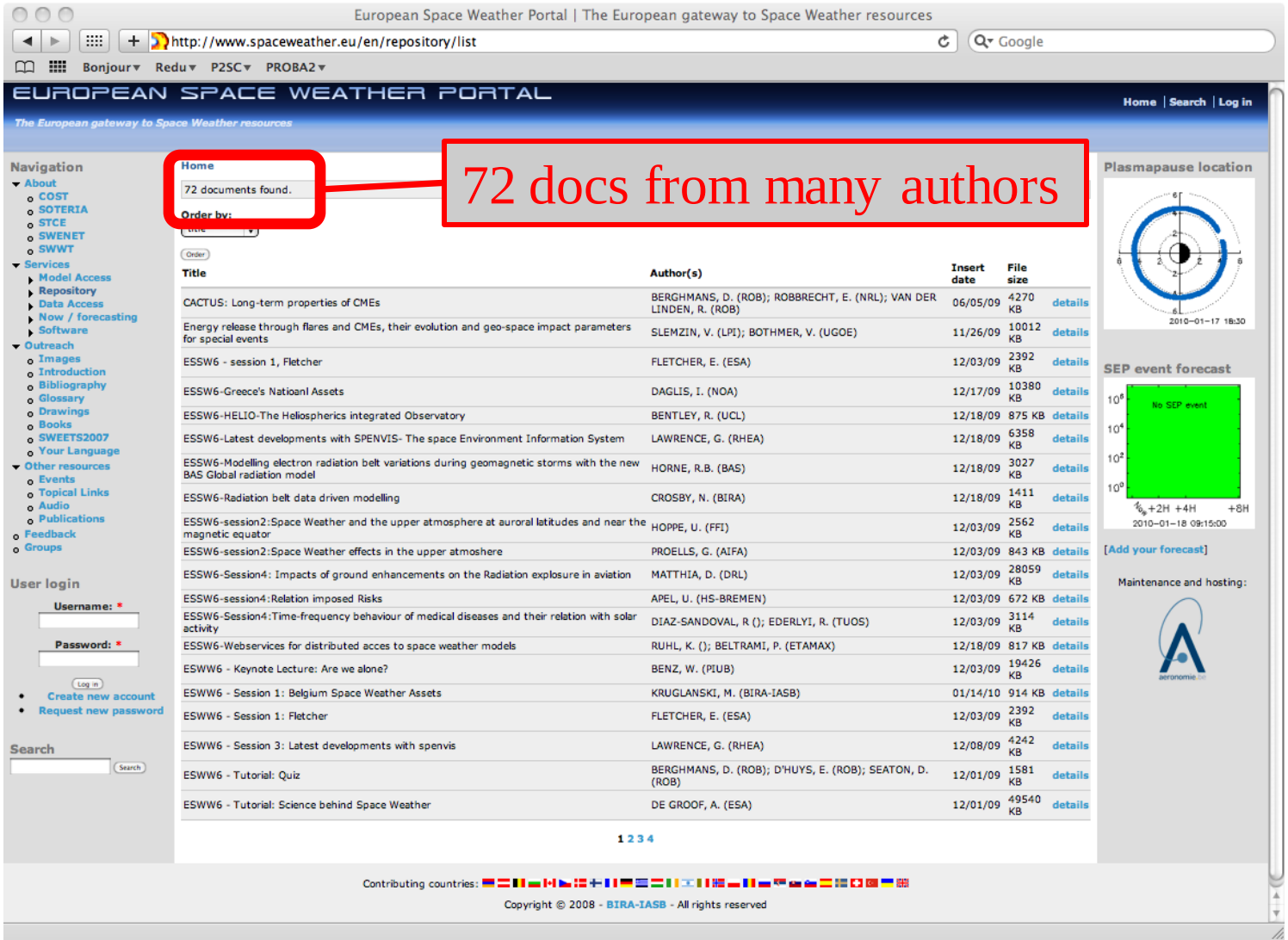
WP6: Distribution of and dissemination: Dr. Berghmans

Soteria Web Page

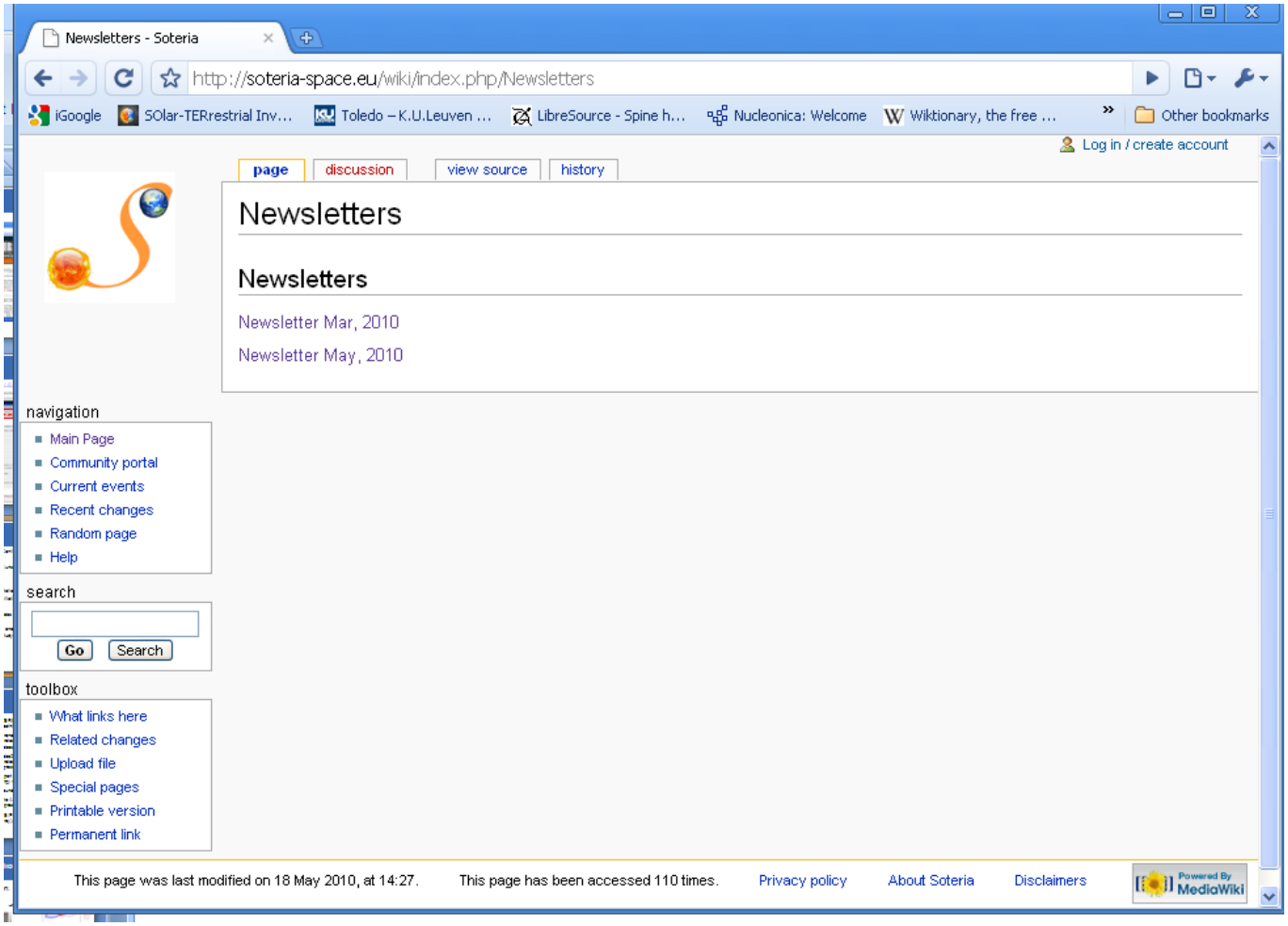
Document Repository

KATHOLIEKE UNIVERSITEIT LEUVEN

Document repository at http://www.spaceweather.eu



Newsletters



WP2 - Successes

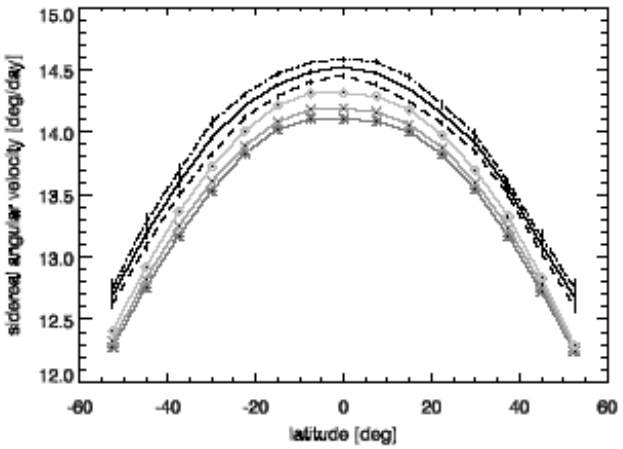
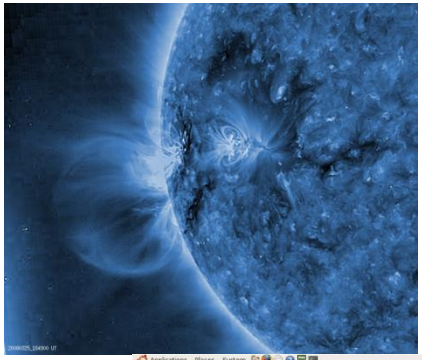


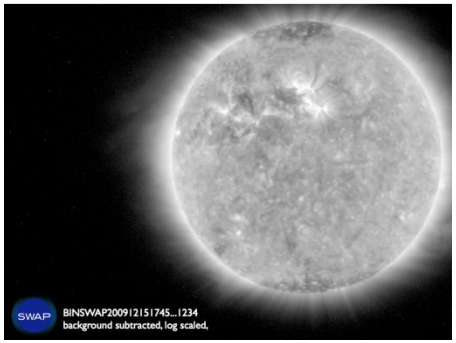
Fig. 1. Rotation velocity derived from ring-diagram analysis at 3Mm (asterisk), 7Mm (cross), 15Mm (diamond) (lines from dark to light grey) and SBCS tracing (black) averaged over the periods: August 2001 – March 2004 (dashed), April 2004 – December 2006 (dashed dotted).

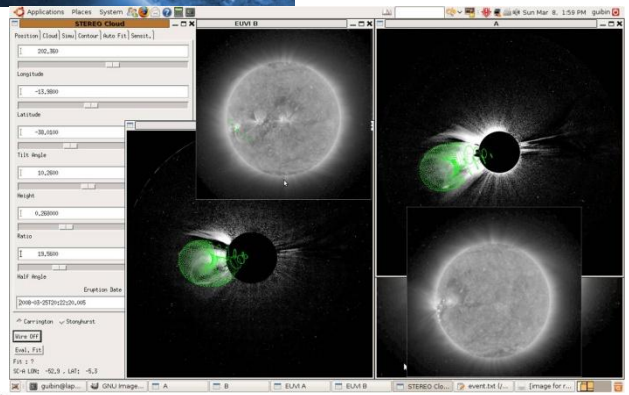
Zaatri et al. (Brajsa) 2009 *A&A*, **504**, 589.

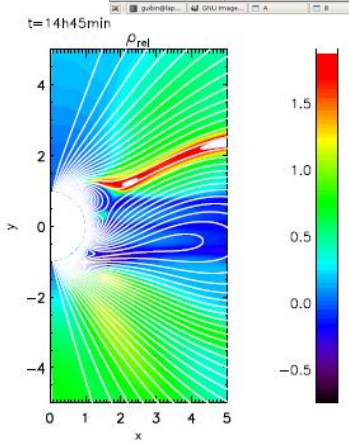
- Vibrant collaborations established among the observatories
- Historical data, example of summer student at ROB
- Online repositories to be linked with the VO (list on web site), examples:
  - SOHO/MDI Continuum faculae: produced by schedule
  - SOHO/MDI Sunspot Data (SDD): produced by schedule
  - daily magnetic observations
  - Debrecen Photoheliographic Data sunspot catalogue
- Publications
  - differential rotation (published, see figure)
  - torsional oscillation of hemispheric cycles (submitted)
  - active longitudes - cooperative study, in progress
  - comparative analysis of DPD, SDD and ISN - cooperative study, in progress

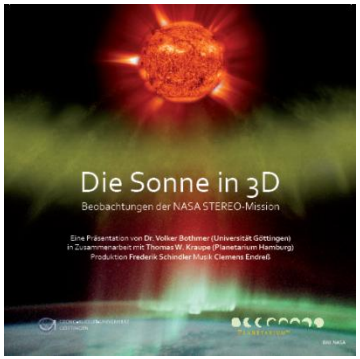
WP3 - Successes











- STEREO operations and archiving smoothly proceeding.
- Coronas/Photon successfully launched and operated. TESIS and SphinX instruments databases established.
- Proba2 successfully launched and operated. SWAP and LYRA database in progress.
- Report on 3D structure (STEREO) and energy release of flares and CMEs.
- Ground-Based Telescope Developments
- Data Analysis Modelling,Simulations in Progress.
- E/PO Material Established (DVD, blu-ray).

WP4: Progress so far - Heliosphere

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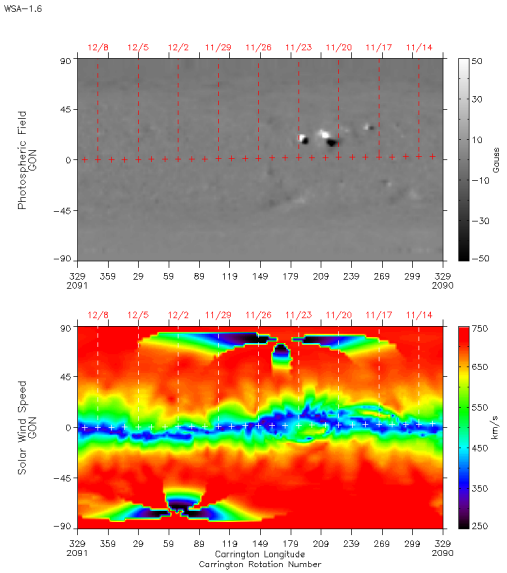
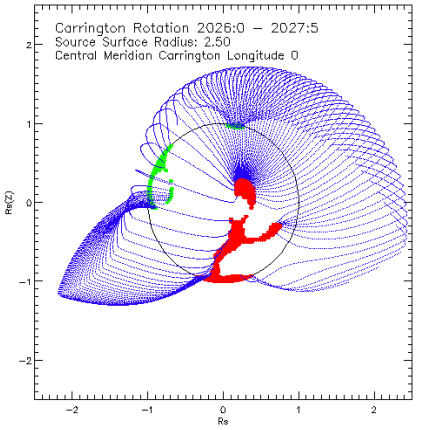
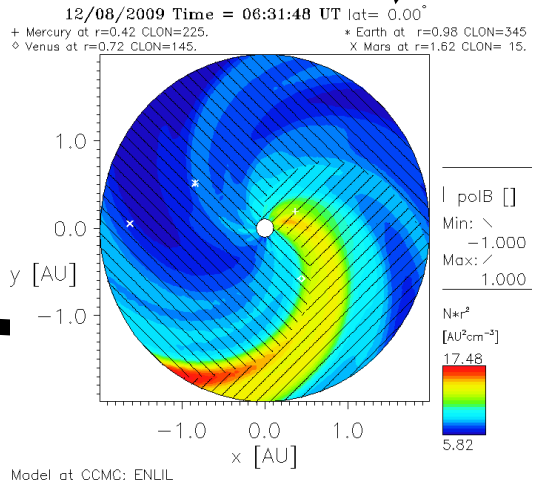
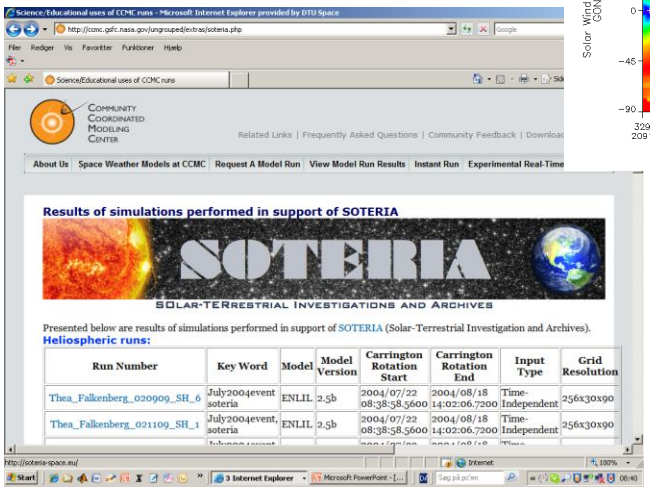
Soalar Wind, CME propagation: Comparing/validating models

Data assimilation into solar wind modelling





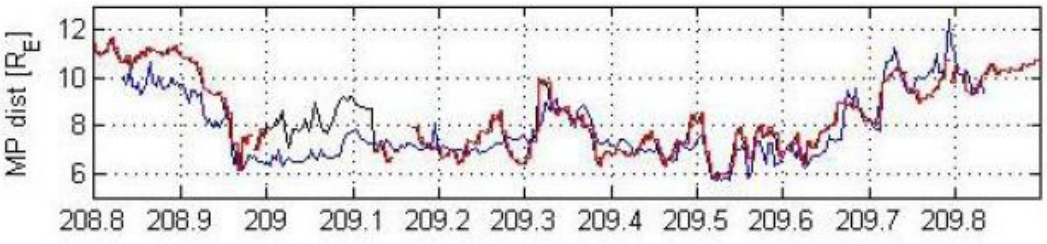




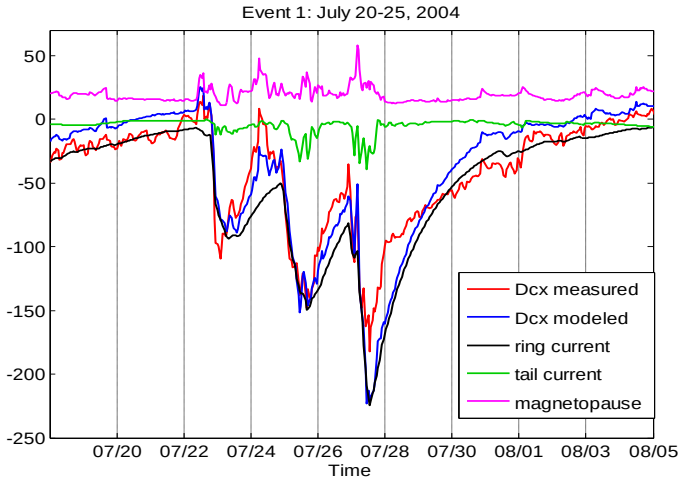
WP4: Progress so far - Magnetosphere

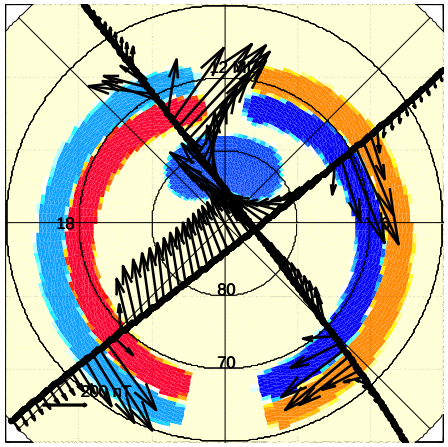
Magnetopause location: Validating and comparing models

Coronal holes - Predicting Dst



Geomagnetic monitoring: Dst/Dcx – separating contributions

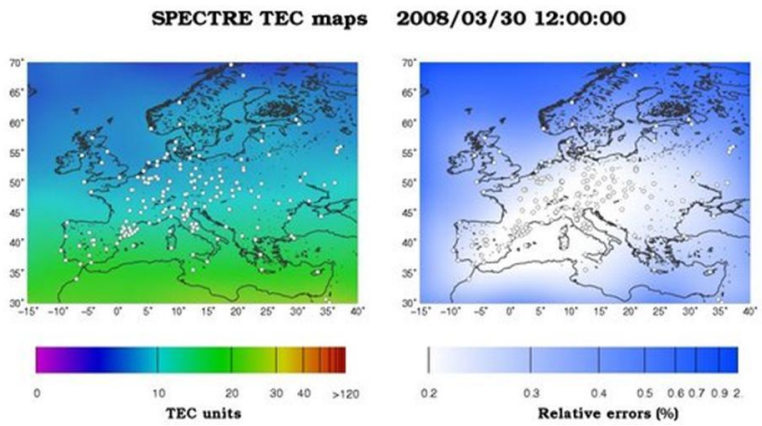




Auroral oval currents –

Inversion of magnetic satellite data

WP4: Progress so far - Ionosphere

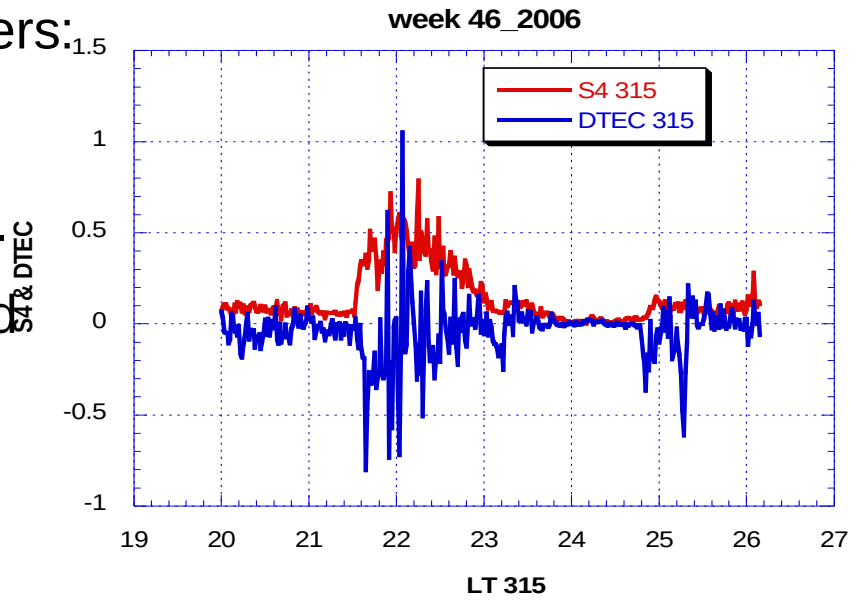


Provision of TEC Maps and timeseries from GPS data

Comparison between focus parameters: Scintillations, TEC and Dst

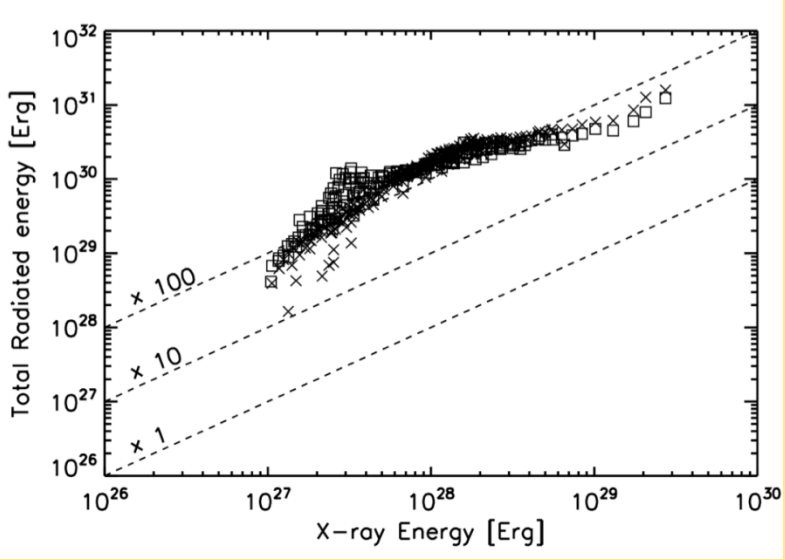
Evidence for relation between scintillations and TEC rate of change.

No correlation found between Dst and low latitude scintillations

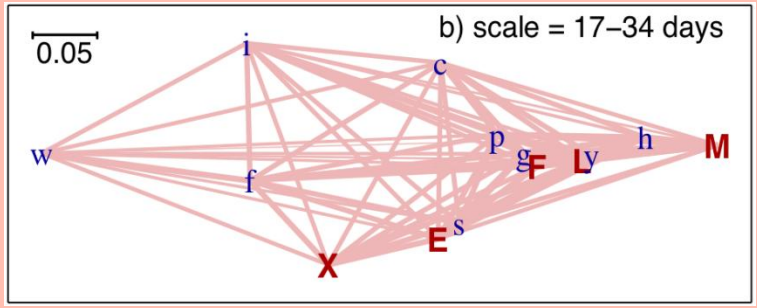


WP5 *Irradiance*: Progress

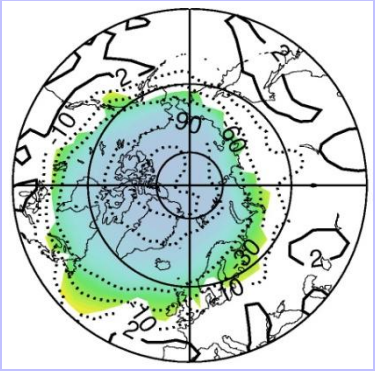
All solar flares emit most of their energy in visible light *(Kretzschmar et al., 2009)*



How well do various solar proxies describe spectral bands ? *(Dudok de Wit et al., 2009)*



Expanding the global chemistry-climate-ionosphere model SOCOL-i to the lower ionosphere *(Egorova et al., 2010)*



New directions :

* Long-term variability of the total solar irradiance : modelling and implications on climate change
* Response to ESA Space Situational Awareness programme : input to orbitography models
* Workshop on future trends in solar spectral irradiance measurements

WP6: Successes

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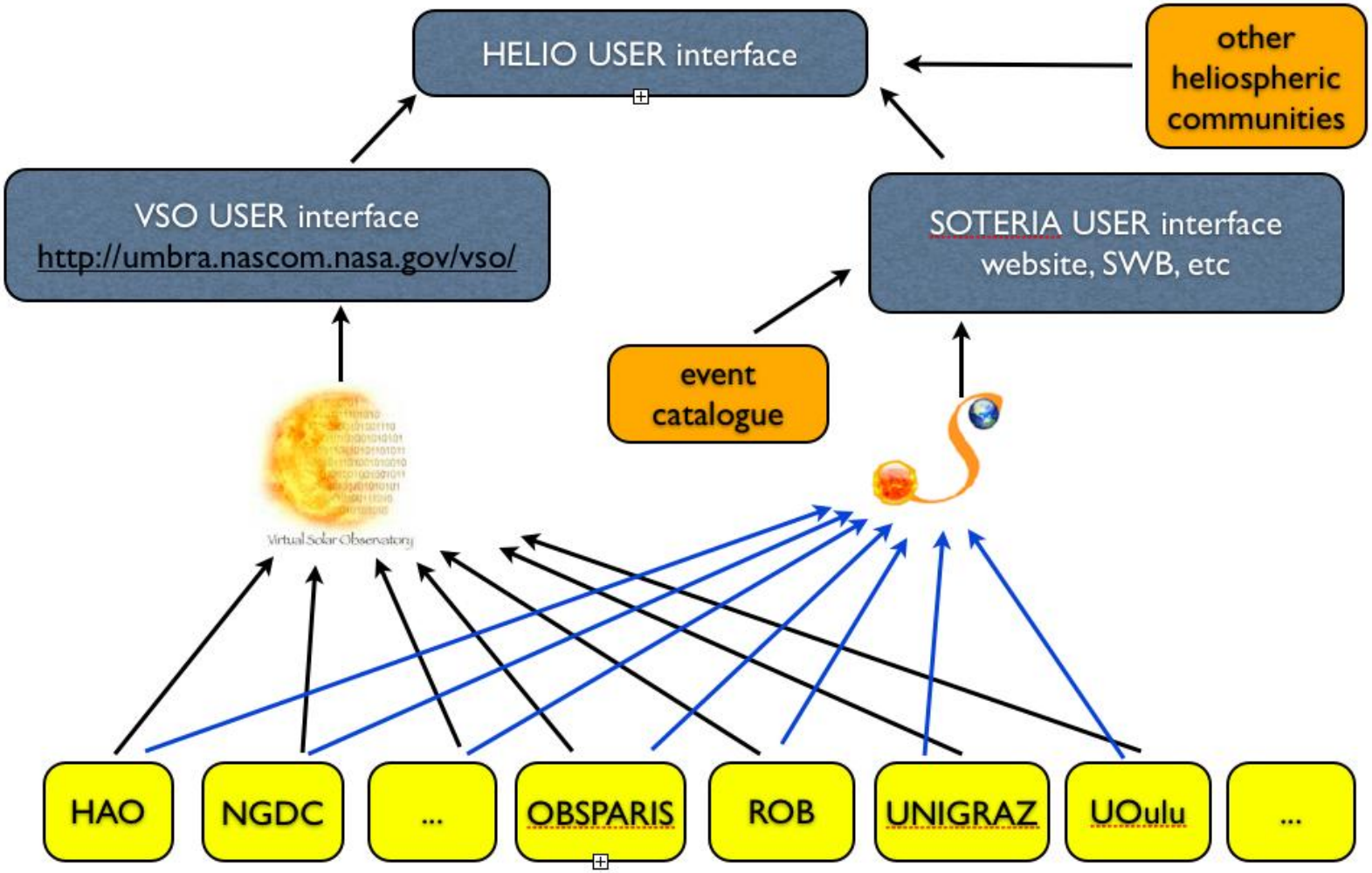
CASSIS FP7 coordination activity



Major upcoming events

- School organised with COST and ICTP
- Capacity Building Workshop organised in Brussel
- Full exploitation of PROBA2 that now is operative
- Full exploitation of SDO that now is operative
- Focus on continuing and increasing the collaborations established so far
- Thematic workshops, visits and exchange of personnel among the beneficiaries
- Second annual meeting in October
- Web resources

Summer School

Summer School

In collaboration with:

- COST Action on space weather
- ICTP Trieste
- To be held in Trieste
- Public outreach event, educational and involving scientists outside Soteria

Capacity Building Workshop

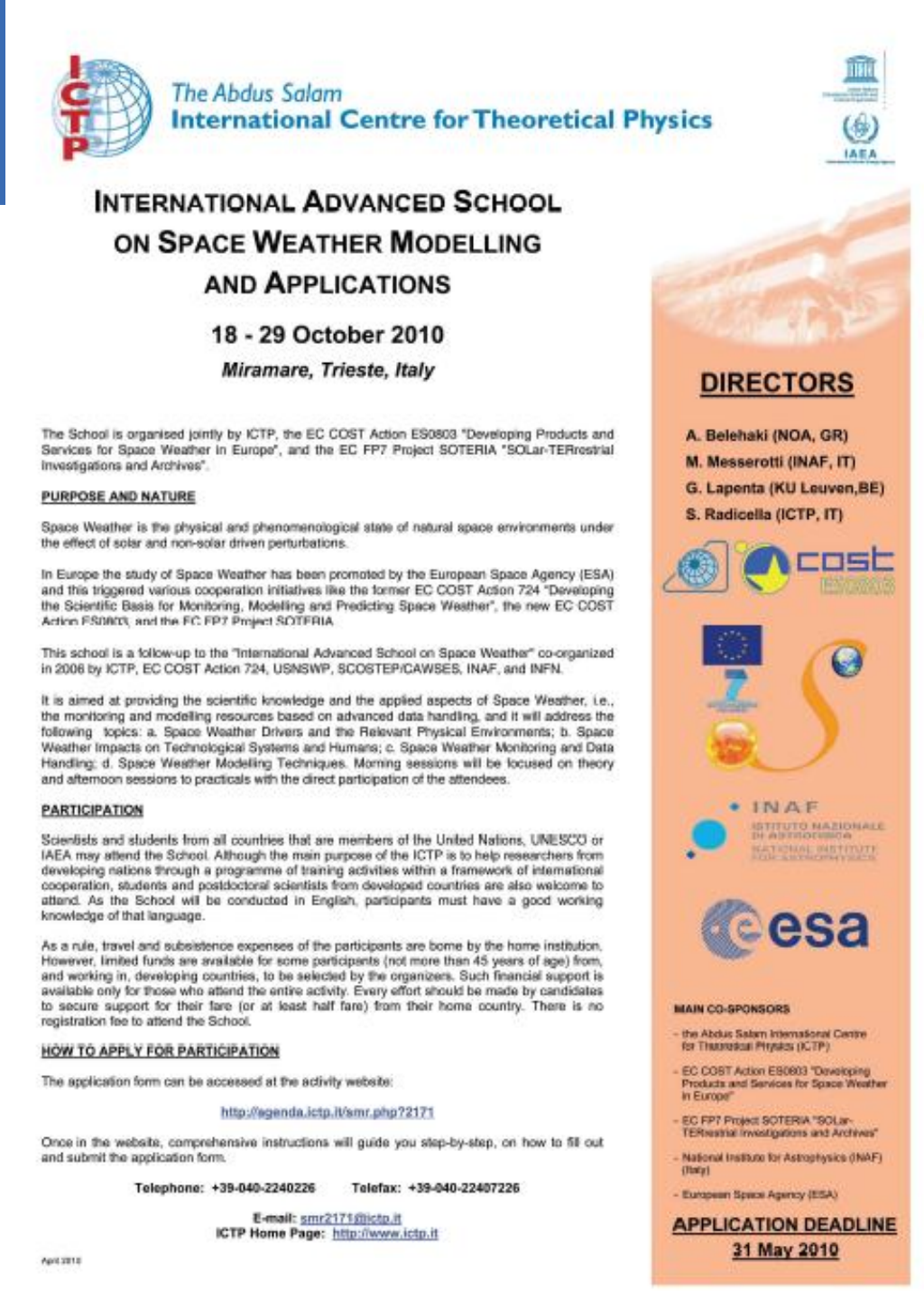
Internal event organized by ROB Brussel

In Brussel

The scope is to train all Soteria members to the use of a common data management software and practice

School on Space Weather

- Over 180 applicants
- Two weeks
- Speakers being invited now
- Topics in space physics, space weather evets, effects on technology and people



The Abdus Salam International Centre for Theoretical Physics

IAEA

INTERNATIONAL ADVANCED SCHOOL ON SPACE WEATHER MODELLING AND APPLICATIONS

18 - 29 October 2010

Miramare, Trieste, Italy

The School is organised jointly by ICTP, the EC COST Action ES0803 "Developing Products and Services for Space Weather in Europe", and the EC FP7 Project SOTERIA "SOLar-TERrestrial Investigations and Archives".

PURPOSE AND NATURE

Space Weather is the physical and phenomenological state of natural space environments under the effect of solar and non-solar driven perturbations.

In Europe the study of Space Weather has been promoted by the European Space Agency (ESA) and this triggered various cooperation initiatives like the former EC COST Action 724 "Developing the Scientific Basis for Monitoring, Modelling and Predicting Space Weather", the new EC COST Action ES0803, and the FC FP7 Project SOTERIA.

This school is a follow-up to the "International Advanced School on Space Weather" co-organized in 2006 by ICTP, EC COST Action 724, USNSWP, SCOSTEP/CAWSES, INAF, and INFN.

It is aimed at providing the scientific knowledge and the applied aspects of Space Weather, i.e., the monitoring and modelling resources based on advanced data handling, and it will address the following topics: a. Space Weather Drivers and the Relevant Physical Environments; b. Space Weather Impacts on Technological Systems and Humans; c. Space Weather Monitoring and Data Handling; d. Space Weather Modelling Techniques. Morning sessions will be focused on theory and afternoon sessions to practicals with the direct participation of the attendees.

PARTICIPATION

Scientists and students from all countries that are members of the United Nations, UNESCO or IAEA may attend the School. Although the main purpose of the ICTP is to help researchers from developing nations through a programme of training activities within a framework of international cooperation, students and postdoctoral scientists from developed countries are also welcome to attend. As the School will be conducted in English, participants must have a good working knowledge of that language.

As a rule, travel and subsistence expenses of the participants are borne by the home institution. However, limited funds are available for some participants (not more than 45 years of age) from, and working in, developing countries, to be selected by the organizers. Such financial support is available only for those who attend the entire activity. Every effort should be made by candidates to secure support for their fare (or at least half fare) from their home country. There is no registration fee to attend the School.

HOW TO APPLY FOR PARTICIPATION

The application form can be accessed at the activity website:

http://agenda.ictp.it/smr.php?2171

Once in the website, comprehensive instructions will guide you step-by-step, on how to fill out and submit the application form.

Telephone: +39-040-2240226 **Telefax: +39-040-22407226**

E-mail: smr2171@ictp.it
ICTP Home Page: http://www.ictp.it

April 2010

DIRECTORS

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S. Radicella (ICTP, IT)

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- the Abdus Salam International Centre for Theoretical Physics (ICTP)
- EC COST Action ES0803 "Developing Products and Services for Space Weather in Europe"
- EC FP7 Project SOTERIA "SOLar-TERrestrial Investigations and Archives"
- National Institute for Astrophysics (INAF) (Italy)
- European Space Agency (ESA)

APPLICATION DEADLINE
31 May 2010