STCE Newsletter

8 Jun 2015 - 14 Jun 2015

Published by the STCE - this issue : 19 Jun 2015. Available online at http://www.stce.be/newsletter/ .

The Solar-Terrestrial Centre of Excellence (STCE) is a collaborative network of the Belgian Institute for Space Aeronomy, the Royal Observatory of Belgium and the Royal Meteorological Institute of Belgium.

Final Editor : Petra Vanlommel
Contact : R. Van der Linden, General Coordinator STCE,
Ringlaan - 3 - Avenue Circulaire, 1180 Brussels,
Belgium

1. Touring the Space Pole

The STCE Annual meeting 2015 took place on 11 June. After a brief introduction by Ronald, a fully packed Meridian room first enjoyed a presentation on SOLSPEC by David Bolsée after which Simon Chabrillat gave a summary on the workshop "Natural Hazards assessment for Aviation" (see the Newsletter at http://www.stce.be/newsletter/pdf/2015/STCEnews20150605.pdf).

Then started the main part of the meeting, i.e. the visit of various important but not-so-well-known labs and tools which are spread all over the Space Pole. For this "Points-of-Interest" tour, the participants were split into small groups of about 5 persons. Each group was accompanied by a guide who knew his/her way around the Pole. The visit of each point took only 10 minutes or less, making this a quite dynamical and very interactive walk.

Visits included the high-tech Detector Lab (Samuel Gissot and Boris Giordanengo), the SDO Data center (Koen Stegen) which handles 1.5 Terabytes (!) per day, and the meteo measurements and satellite techniques lab showing amongst other the cubesats (Andre Chevalier and Christian Conscience) - Images above.

The visit to the Electronics Lab and Engineering Realisations (Eddy Neefs and Sophie Berkenbosch) gave the participants a good idea on the fine art of soldering. Michel Kruglanski showed the very operational nerve centre B.USOC (Belgian User Support and Operations Centre), and provided a practical example with the FSL (Fluid Science Laboratory) which is aboard the ISS but controlled and operated from the B.USOC.

The tour continued with a visit of the very Clean Room (Eddy Equeter), and participants also enjoyed an impressive performance of the 3D printer and machinery (Jeroen Maes).

There was also a tour stop at the big meteor antenna (Hervé Lamy) in the meteo park, as well as at the Solar Mechanics and Electronics lab and the Solar Dome (Jean-Luc Dufond, Aydin Ergen and Ghislain Rigo). The sunny weather provided also an opportunity for sunspot observing.

One more point-of-interest remained, and that was the canteen of the RMI where food and refreshments were served and much appreciated. It concluded a great edition of the STCE Annual meeting.

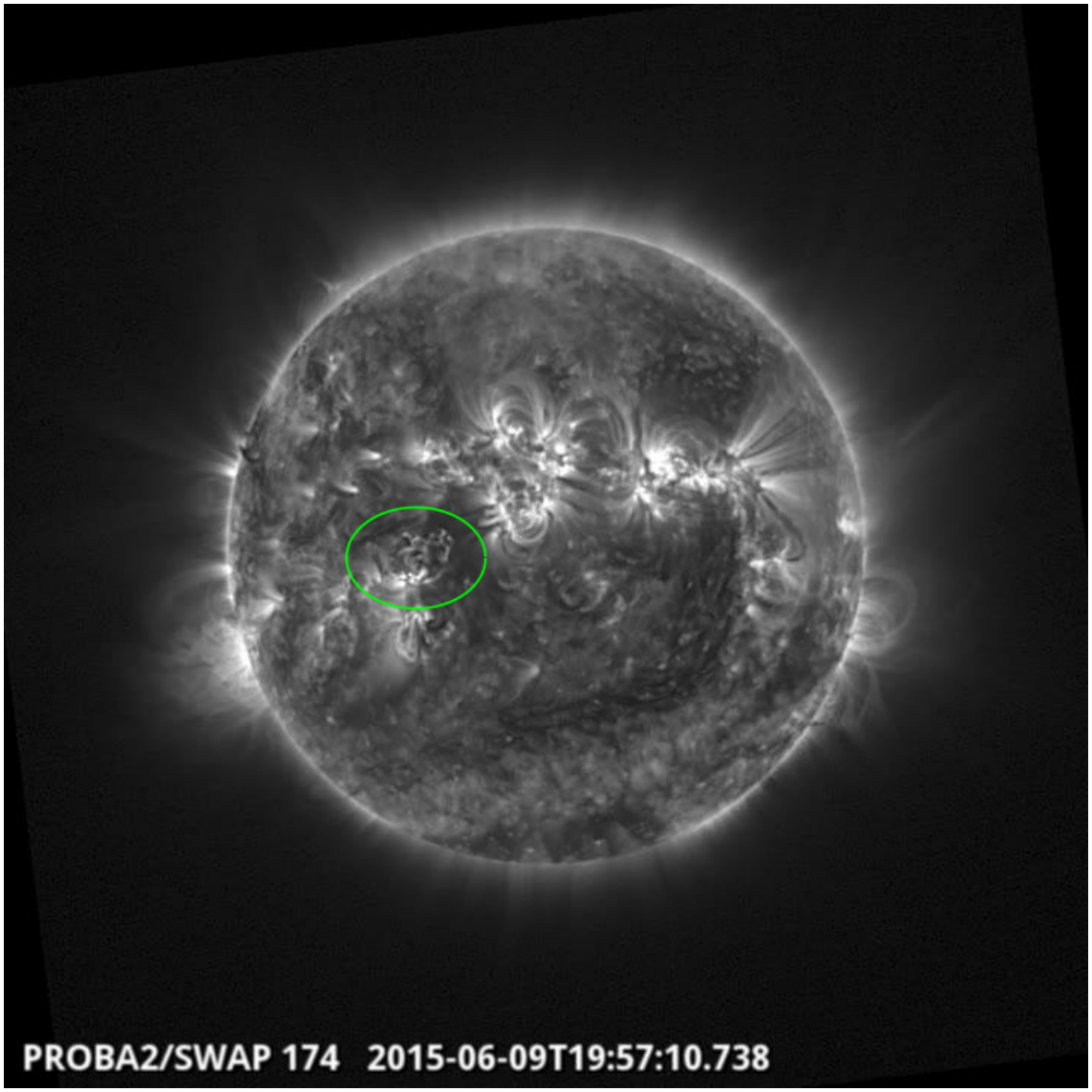
2. PROBA2 Observations (8 Jun 2015 - 14 Jun 2015)

Solar Activity

Solar flare activity fluctuated between very low and moderate during the week.
In order to view the activity of this week in more detail, we suggest to go to the following website from which all the daily (normal and difference) movies can be accessed:http://proba2.oma.be/ssa
This page also lists the recorded flaring events.

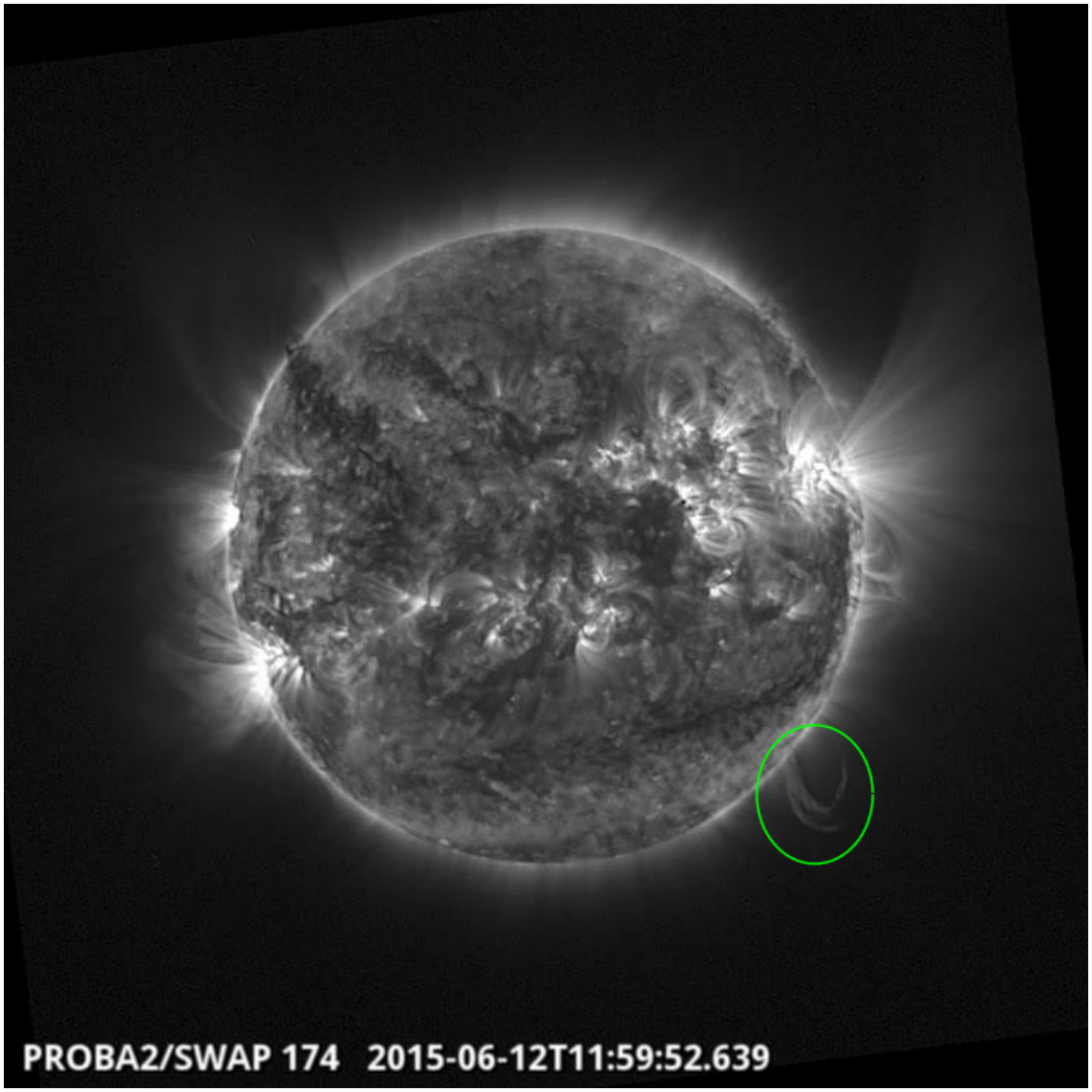
A weekly overview movie can be found here (SWAP week 272).
http://proba2.oma.be/swap/data/mpg/movies/weekly_movies/weekly_movie_2015_06_08.mp4
Details about some of this week's events, can be found further below.

Tuesday Jun 09



C--Flare on the east half @ 19:57 SWAP image
Find a movie of the event here (SWAP movie)
http://proba2.oma.be/swap/data/mpg/movies/20150609_swap_movie.mp4

Friday Jun 12

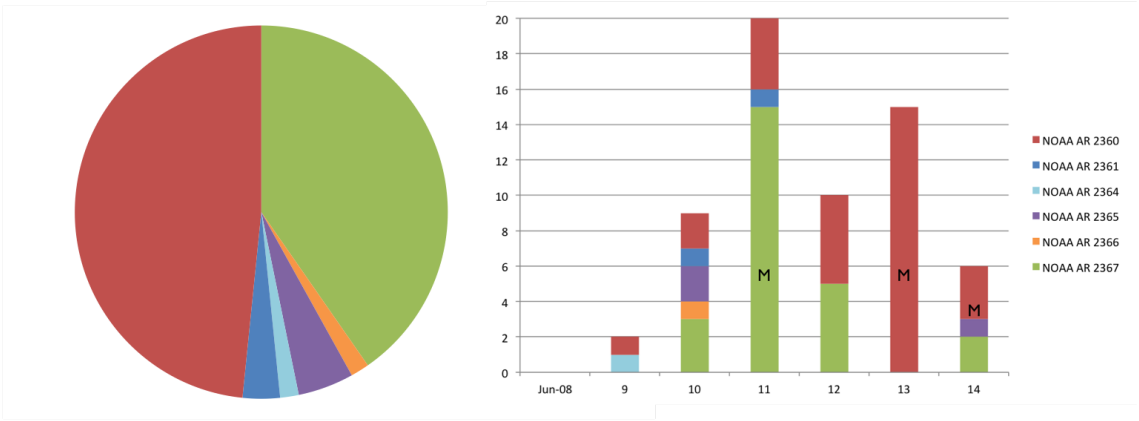


Plasma dynamics on the west limb @ 11:59 SWAP image
Find a movie of the event here (SWAP movie)
http://proba2.oma.be/swap/data/mpg/movies/20150612_swap_movie.mp4

3. Review of solar activity

Solar activity was low to moderate with fifty-nine C- and three M-class flares occurring during the past week. NOAA regions 2360 and 2367 were the regions with the largest contribution, while a few flares were produced by NOAA 2361, 2364, 2365 and 2366. The strongest flare was a M2.0 flare on June 14.

Distribution of >B flares, June 8 – 14, 2015

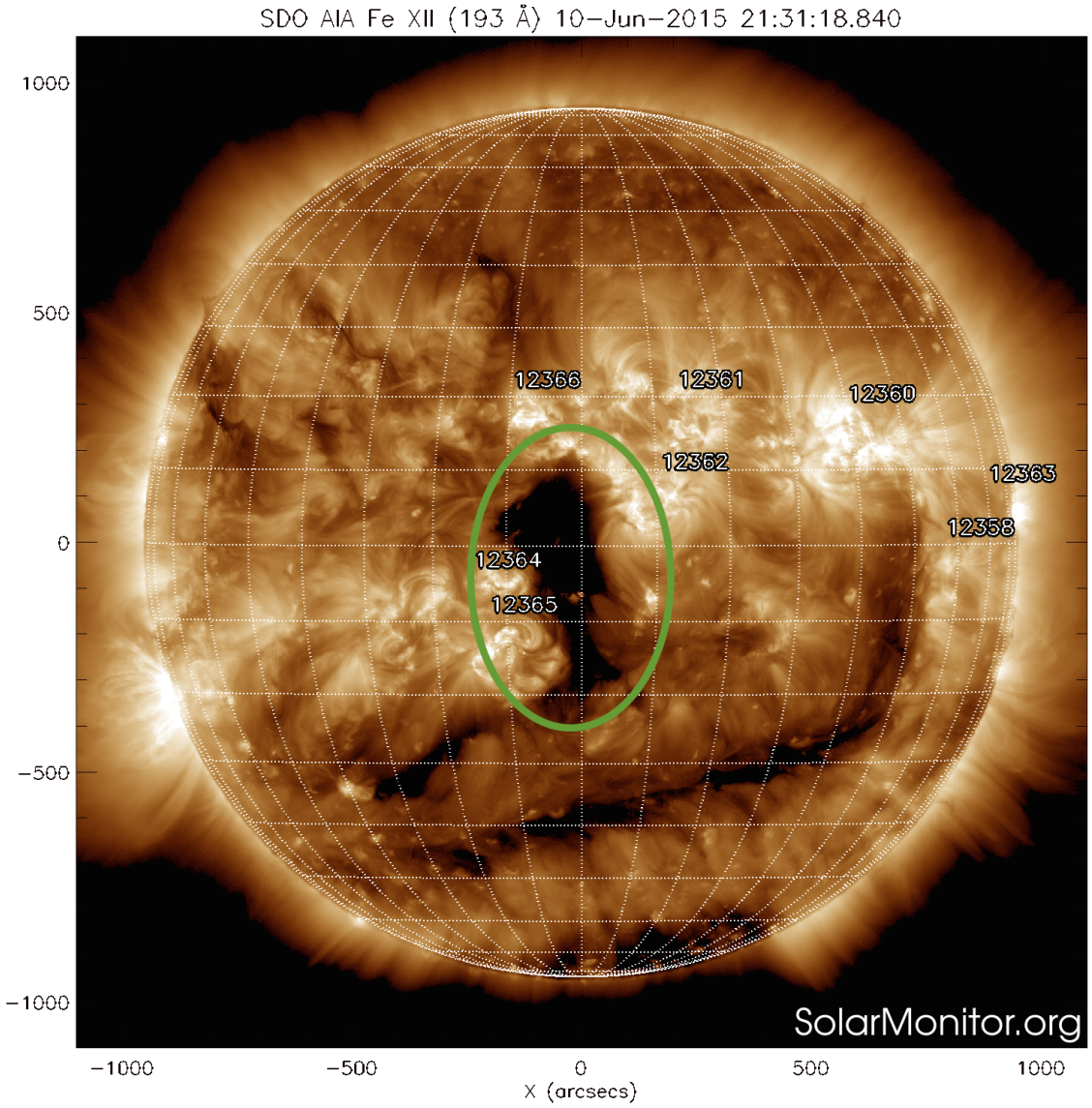


The left chart gives an overview of the total number of flares per NOAA AR region for the indicated week. The right chart gives an overview of the flaring activity per NOAA AR per day.

One partial halo CME was observed, with first measurement in LASCO/C2 at 20:24 UT on June 9. At the first analysis, it was perceived to be a frontside event. However, the position of the source region did not fully match. Even without any signature in STEREO images, the event was determined as back sided. The source region could not be assigned with complete certainty.

There were a few filament eruptions, e.g. on June 9 and 14 in the northeast quadrant, but without any strong geoeffective CMEs.

A small equatorial coronal hole crossed the central meridian on June 11. The associated solar wind flow arrived on June 14 (see Review of Geomagnetic Activity).



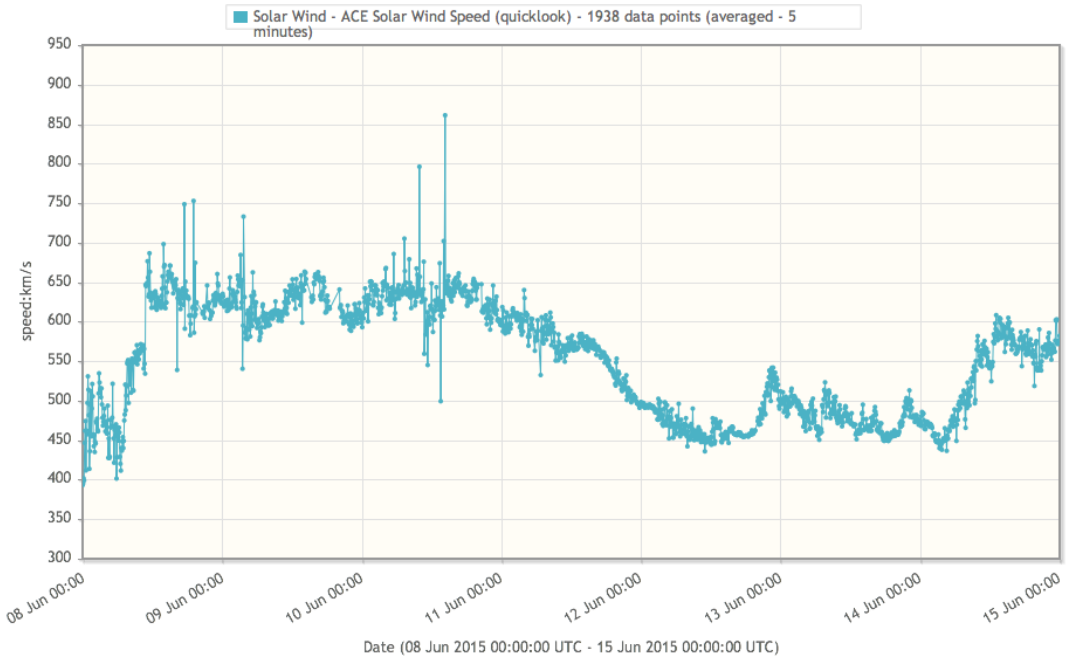
4. Noticeable Solar Events (8 Jun 2015 - 14 Jun 2015)

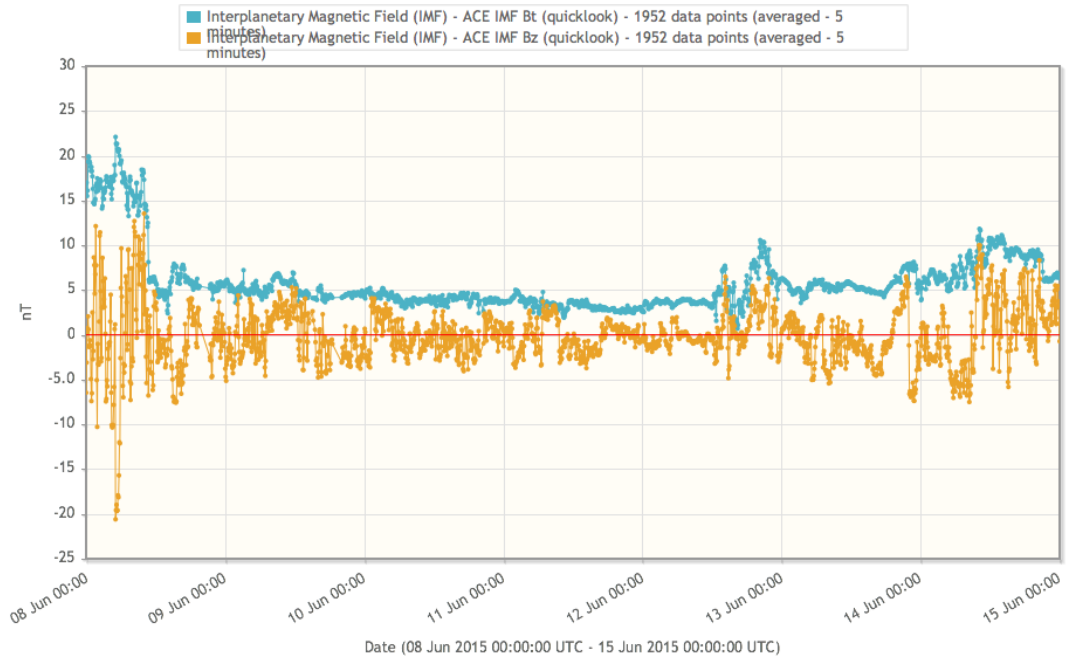
DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA
11	0849	0855	0859		M1.0					2367
13	0720	0729	0747	N11W78	M1.3	SF			79	2360
14	0052	0059	0109	N14W73	M2.0	SF			79	2360

LOC: approximate heliographic location
XRAY: X-ray flare class
OP: optical flare class
10CM: peak 10 cm radio flux
TYPE: radio burst type
Cat: Catania sunspot group number
NOAA: NOAA active region number

5. Review of geomagnetic activity

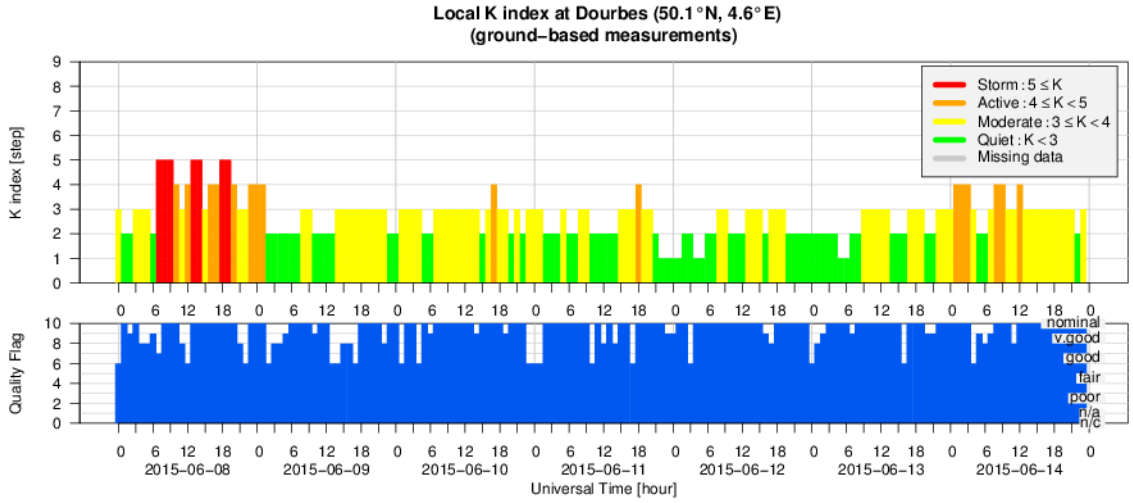
In the beginning of the week the solar wind was under influence of a high speed stream emanating from a coronal hole that passed the central meridian on June 4. Solar wind speed increased to maximally 700 km/s and the magnitude of the interplanetary magnetic field (IMF) peaked at 23 nT with periods of a negative north-south component down to -21 nT. Solar wind speed gradually declined on June 11 and 12 and the magnitude of the IMF was near 5 nT till the arrival of a weak transient, at 12:30 UT on June 12. The magnitude of the IMF became more variable and went to 11 nT. Another high speed stream associated to the above mentioned equatorial coronal hole resulted on June 14 in a limited increase of the solar wind speed (to 620 km/s) and fluctuation of the IMF magnitude (to maximally 12 nT).



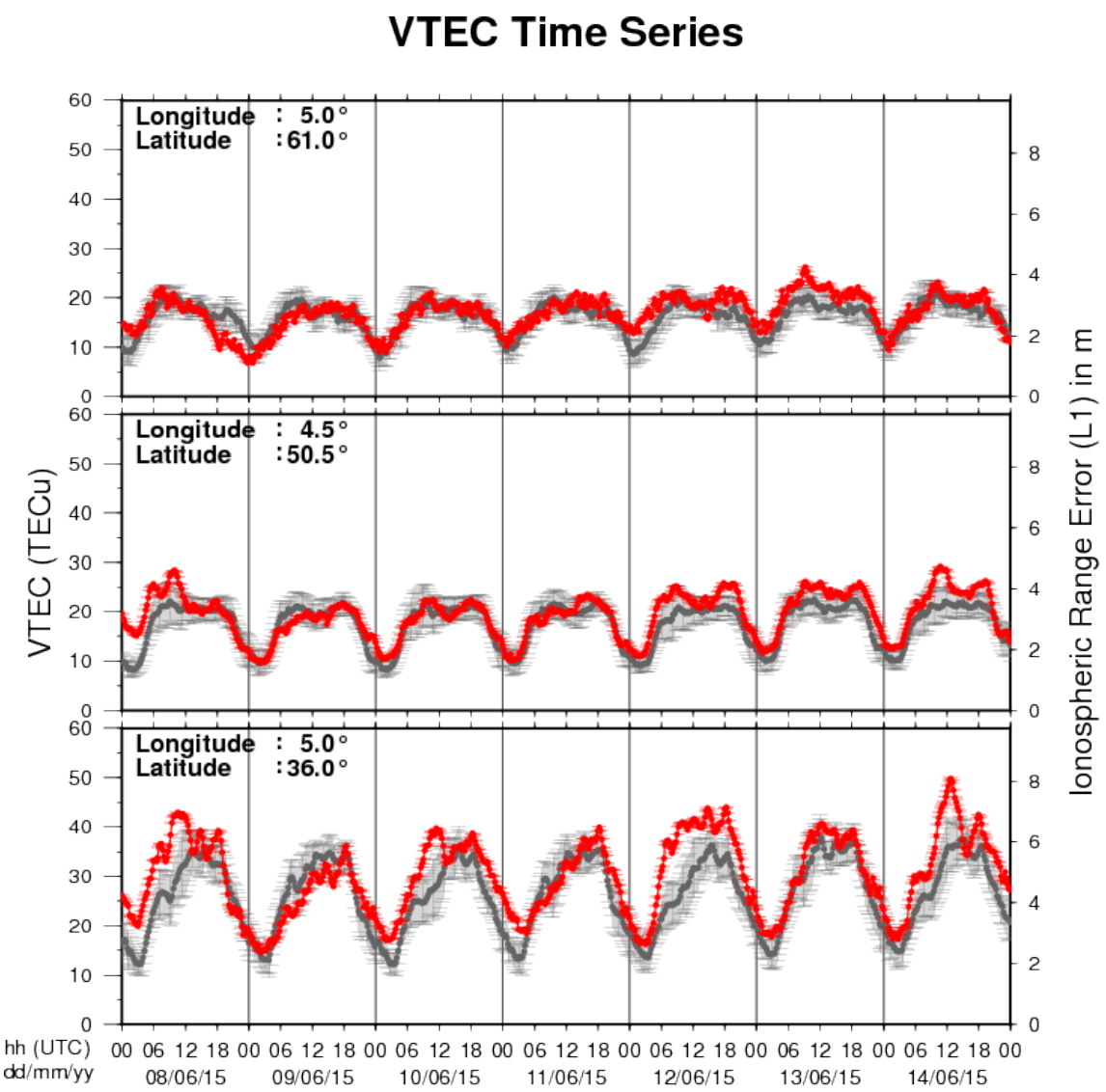


From June 9 to 13, geomagnetic conditions were quiet (K=1 to 2) to unsettled (K=3) with a few isolated slots of active (K=4) levels. Minor storm levels were reached on June 8 at the local level (Dourbes K=5) and even major storm levels at the planetary level (NOAA estimated Kp=6 from the slot 6-9 UT). The planetary index reached minor storm level for one time slot (9-12 UT) on June 14.

6. Geomagnetic Observations at Dourbes (8 Jun 2015 - 14 Jun 2015)



7. Review of ionospheric activity (8 Jun 2015 - 14 Jun 2015)



The figure shows the time evolution of the Vertical Total Electron Content (VTEC) (in red) during the last week at three locations:
a) in the northern part of Europe(N61°, 5°E)
b) above Brussels(N50.5°, 4.5°E)
c) in the southern part of Europe(N36°, 5°E)
This figure also shows (in grey) the normal ionospheric behaviour expected based on the median VTEC from the 15 previous days.

The VTEC is expressed in TECu (with TECu=10^16 electrons per square meter) and is directly related to the signal propagation delay due to the ionosphere (in figure: delay on GPS L1 frequency).
The Sun's radiation ionizes the Earth's upper atmosphere, the ionosphere, located from about 60km to 1000km above the Earth's surface.The ionization process in the ionosphere produces ions and free electrons. These electrons perturb the propagation of the GNSS (Global Navigation Satellite System) signals by inducing a so-called ionospheric delay.

See http://stce.be/newsletter/GNSS_final.pdf for some more explanations ; for detailed information, see http://gnss.be/ionosphere_tutorial.php

8. Future Events

For more details, see http://www.spaceweather.eu/en/event/future

National Astronomy Meeting 2015 in Llandudno, UK

Start : 2015-07-05 - End : 2015-07-09
We would like to invite you to submit contributed abstracts to the parallel session "The science of space weather: progressing our understanding" at the 2015 UK National Astronomy Meeting from 5-9 July (http://nam2015.org). The abstract-submission deadline is 1 April 2015. Observers, modellers, and theoreticians are all welcome. We also welcome participation from end users interested in how the science of space weather is advancing.
The science of space weather: progressing our understanding
The goal of this session is to provide an opportunity to discuss the scientific research that underpins space weather and how a new generation of operational space weather measurements could best be utilised to further progress our understanding. Specific topics are likely to include 1) gaps in our understanding of space weather and how to resolve them, 2) new space and ground-based data that are needed, 3) new science that can be carried out with the operational space weather measurements being planned today.
This session is motivated by the fact that the UK has a strong heritage in the science of the coupled Sun-Earth system, from both an observational and theoretical perspective. This research is increasingly being applied to the area of space weather monitoring and forecasting, a topic that is now nationally recognised as an important natural hazard for the UK (highly ranked in the National Risk Register) and the subsequent opening of the Met Office Space Weather Operations Centre in 2014.
Up until now, both the research and the space weather monitoring and forecasting have utilised mainly data from instrumentation (both space- and ground-based) designed to answer pertinent scientific questions, though some operational instruments (e.g. the X-ray and particle detectors on NOAA's GOES spacecraft) are also widely exploited for scientific use. However, there is now growing interest in deploying more instruments, in space and on the ground, designed to support operational space weather services. Such operational measurements can facilitate new science, as demonstrated by the extensive research use of GOES data, but it is important that the limitations imposed by operational needs are discussed.
Website: http://nam2015.org/

CISM Space Weather Summer School in Boulder, CO, USA

Start : 2015-07-13 - End : 2015-07-24
The CISM Summer School is intended to give students a comprehensive immersion in the subject of space weather: what it is, what it does, and what can be done about it. Space weather is many things: beautiful when seen through the eyes of a sun-viewing telescope, fascinating when studied for its alien worlds of magnetic structures and phenomena, awesome when witnessed as a solar eruption or auroral storm, and devastating to the users of services it disrupts. Space weather links the Sun, the Earth, and the space in between in a branching chain of consequences. Weather systems on the Sun can spawn interplanetary storms of colossal size and energy that envelop the whole planet in electrical hurricanes. Such storms attack high-tech, complex, and expensive technological systems that provide much of the infrastructure that allows modern society to function.
Website:
https://www2.hao.ucar.edu/Events/2015-CISM-Summer-School

Loops7: Heating of the Magnetically Closed Corona in Cambridge, UK

Start : 2015-07-21 - End : 2015-07-23

The conference will review past and recent achievements, as well as future challenges in the field of solar coronal loop physics.
Website:
http://www.damtp.cam.ac.uk/user/astro/cl7/index.html

Heliophysics Summer Schoool 2015: Seasons in Space: Cycles of variability of Sun-Planet systems, in Boulder, CO, USA

Start : 2015-07-28 - End : 2015-08-04
Heliophysics is all of the science common to the field of the Sun-Earth connections. This fast-developing field of research covers many traditional sub-disciplines of space physics, astrophysics, and climate studies. The NASA Living with a Star program, with its focus on the basic science underlying all aspects of space weather, acts as a catalyst to bring the many research disciplines together to deepen our understanding of the system of systems formed by the Sun-Earth connection.
Website:
http://www.heliophysics.ucar.edu/

34th International Cosmic Ray Conference (ICRC) in The Hague, The Netherlands

Start : 2015-07-30 - End : 2015-08-06
The 34th International Cosmic Ray Conference (ICRC) will be held from July 30 to August 6, 2015, in The Hague, The Netherlands. It is an important and large conference in the field of Astroparticle Physics. The ICRC covers: cosmic-ray physics, solar and heliospheric physics, gamma-ray astronomy, neutrino astronomy, and dark matter physics.
Website: http://icrc2015.nl

SOLARNET III / HELAS VII: The Sun, the stars, and solar-stellar relations, in Freiburg (Germany)

Start : 2015-08-31 - End : 2015-09-04
The purpose of this conference is to discuss the latest questions and results in solar and stellar physics. Solar and stellar seismology will be one particular focus but contributions on all aspects of solar-stellar relations will be welcome. We aim to establish links and synergies between the day- and night-time fields of astrophysics.
Website:
http://www.iac.es/congreso/solarnet-3meeting/

1st Joint Solar Probe Plus-Solar Orbiter Workshop, in Florence (Italy)

Start : 2015-09-02 - End : 2015-09-04
The Workshop will address how the joint exploration of the corona and inner heliosphere will lead to advances in our understanding of coronal heating and solar wind acceleration, the magnetic and plasma structure of the heliosphere, and the acceleration of energetic particles at shocks and flares. The workshop will inspire research that will make use of SO and SPP observations within the context of the NASA Heliophysics Observatory System and identify key areas for preparatory research. Synergistic observations from other ground based and space based assets will also be addressed.
Website:
http://www.solarprobeplus.org/2015/

International Workshop and School on Solar System plasma in Mamaia, Romania

Start : 2015-09-06 - End : 2015-09-13
The International Workshop and School on solar system plasma turbulence, intermittency and multifractals (STORM 2015) focus on the quantitative experimental, theoretical and numerical investigation of turbulence, intermittency, fractal/multifractal features, waves and coherent structures

interaction, criticality and non-linear cross-scale coupling. As widely documented by in-situ satellite measurements and remote or ground-based observations, turbulence, intermittency and dynamical complexity are quite ubiquitous processes observed in the dynamics of solar, planetary and interplanetary plasmas, as well as in the dynamical evolution of proxies linked to magnetospheric and ionospheric variability.
Unfolding the spatio-temporal structure of magnetic field and plasma fluctuations from experimental observations and numerical simulations provides further insight on the structure of plasma turbulence and intermittency. On the theoretical side, the understanding of such complex dynamical behavior cannot be simply surmised from the basic fluid/kinetic equations, but instead requires novel theoretical, experimental and data analysis approaches. The workshop is a forum to present and discuss latest results in these fields. The purpose of the school is to give to a young audience of Graduate, Ph.D. students, and postdoc scientists, which ideally represents the next generation of scholars in the physics of space plasmas, an overall view of both theoretical and data analysis tools apt to fully exploit unique and unprecedented observations that will be provided by future upcoming mission like Solar Orbiter and Solar Probe Plus.
Website:
http://www.spacescience.ro/conferences/storm2015/

3rd UK-Ukraine-Spain meeting on solar physics and space science in Lviv, Ukraine

Start : 2015-09-07 - End : 2015-09-11
The meeting will cover various aspects of solar physics and space weather related processes. The special emphasis will be paid to progress in data-driven simulations and high-resolution spectro-polarimetry as powerful diagnostic techniques to unravel information about magnetic fields in the photosphere and chromosphere of the Sun.
Website:
http://ssg.group.shef.ac.uk/Conferences/Ukraine_UK_2015/index.html

Summer School on Computational Solar and Astrophysical Modeling in Juelich, Germany

Start : 2015-09-14 - End : 2015-09-18
This summer school will acquaint a generation of young researchers (advanced master students, PhDs, and junior postdoctoral researchers) to modern open-source software efforts adapted to High Performance Computing platforms, with a deliberate focus on hands-on sessions. In these sessions, participants will work with three different open-source software packages, learn about their typical applications and evaluate their performance aspects on massively parallel systems.
Website:
http://www.fz-juelich.de/ias/jsc/EN/Expertise/Workshops/Conferences/CSAM-2015/_node.html

Hinode 9 - International Science Meeting in Belfast, UK

Start : 2015-09-14 - End : 2015-09-18
Hinode is a solar satellite funded jointly by JAXA, NASA, ESA and STFC/UKSA that has entered its ninth year of operations. It has had a major impact across many areas of solar physics and facilitated many fundamental discoveries. These findings are documented in over 850 papers in the refereed literature and hundreds of papers in conference proceedings. With 96 refereed publications in 2013 and more than 81 papers in 2014, Hinode has remained scientifically highly productive. A non-exhaustive list indicates over 100 students globally who are undertaking or have completed PhDs using Hinode data. With the Solar Orbiter on the horizon, there is a good chance that the two missions will operate at the same time. The meeting will help the solar physics community to maximise the science return from the Orbiter.
Website:
https://star.pst.qub.ac.uk/wiki/doku.php/public/hinode9/start

RADECS-2015 in Moscow, Russia

Start : 2015-09-14 - End : 2015-09-18
The aim of RADECS conferences is to provide an annual European forum for the presentation and discussion of the latest advances in the field of radiation effects on electronic and photonic materials, devices, circuits, sensors, and systems. The scope of the conference encompasses technological processes and design techniques for producing radiation tolerant systems for space, aeronautical or terrestrial applications, as well as relevant methodologies for their characterization and qualification. The conference features a technical program, an Industrial Exhibition, and one day tutorial or "short course" on radiation effects. The technical program includes oral and poster sessions and round tables.
Website:
http://www.radecs2015.org/

Multi-wavelength Studies of the Solar Atmosphere: Celebrating the Career of Costas Alissandrakis in in Ioannina, Greece

Start : 2015-09-21 - End : 2015-09-24
On the occasion of the forthcoming retirement of Prof. Costas Alissandrakis, we organize an international solar physics conference as a tribute to his career. Speakers will address the present state of knowledge of topics that include: The quiet Sun; Coronal/chromospheric heating; Solar magnetic fields; Active regions; Flares; Coronal mass ejections; and Shocks.
Website: http://solar15.uoi.gr/

Heliospheric physical processes for understanding Solar-Terrestrial Relations in L'Aquila, Italie

Start : 2015-09-21 - End : 2015-09-26
A good understanding of solar-terrestrial processes is fundamental to modelling the influence of solar variability on the Earth's environment and climate. To capture all the physical aspects of the solar wind-magnetosphere-ionosphere-atmosphere interaction, and also the impact of solar variability on climate, the Sun-Earth system has to be studied as a whole. The main purpose of this school is to provide graduate, PhD students and also young post-doc researchers with a global view of the main physical processes by which solar variability affects the Earth's environment. In addition, an overview of different data analysis and methods for describing solar-terrestrial relations will be given. The school will provide a mix of lectures and activities requiring students participation.
Website:
http://www.cifs-isss.org/

Ground-based Solar Observations in the Space Instrumentation Era in Coimbra, Portugal

Start : 2015-10-05 - End : 2015-10-09
This CSPM-2015 scientific meeting will cover various aspects of solar dynamic and magnetic phenomena which are observed over the entire electromagnetic spectrum: white-light, Hα, Ca II, and radio from ground and in a variety of other wavelengths (white light, UV and EUV, and X-rays) from space. Emphasis will also be placed on instrumentation, observing techniques, and solar image processing techniques, as well as theory and modelling through detailed radiative transfer in increasingly realistic MHD models. The long-term (cyclic) evolution of solar magnetism and its consequence for the solar atmosphere, eruptive phenomena, solar irradiation variations, and space weather, will be in focus. Here, special attention will be devoted to the long-term observations made in Coimbra and also to the results of the SPRING / SOLARNET and SCOSTEP VarSITI studies. In particular, the weak solar activity during the current solar maximum will be discussed. Finally, since this meeting is organised around the 90th anniversary of performing the first spectroheliographic observations in Coimbra, a session will be specially dedicated to new solar instruments (both ground-based and space-borne) that will give access to unexplored solar atmospheric features and dynamic phenomena over the coming years.
Website:

http://www.mat.uc.pt/~cspm2015/

AMS-02 Energetic Particle Workshop in Hawaii, USA

Start : 2015-10-18 - End : 2015-10-24
The workshop aims to bring together experts in the field of cosmic rays and solar energetic particles with an additional focus on their propagation inside the heliosphere and their interaction with the magnetosphere. The talks will present the most recent results related to solar energetic particles (SEPs), solar modulation, space radiation and related phenomena.
Website:
http://www.phys.hawaii.edu/ams02/pages/workshop.php

Third Remote Sensing of the Inner Heliosphere and Space Weather Applications Workshop in Morelai, Michoacan (Mexico)

Start : 2015-10-19 - End : 2015-10-23
The workshop aims to gather experts from the various fields of remoteÂ sensing observations of the inner heliosphere, including whiteÂ light, EUV, and radio observation, together with modellers in order to tackle key outstanding science and spaceÂ weather operational issues, establish closer working relations, and devise the best ways to move the field forward as a whole. In addition, the science learned from remote Âsensing observations is critical to improving our capabilities of spaceÂ weather forecasting. The workshop aims to look at ways in which we can more easily and efficiently share and access the various types of data between individual groups and subÂcommunities and to officially launch the IPS Common Data Format v1.0 (IPSCDFv1.0) now in use. It also aims to allow investigations into ways in which we model the inner heliosphere looking at the advantages and disadvantages of the available modelling, updates on present and future remoteÂsensing capabilities, and investigating further the ways in which these data sets all complement each other and are necessary to gain knowledge and understanding of the fundamental physical processes that occur within the inner heliosphere. These are critical processes that are key to both Heliophysics science as well as to spaceÂweather operations and forecasting.
Website:
http://www.sciesmex.unam.mx/workshop2015/

12th Potsdam Thinkshop in Potsdam, Germany

Start : 2015-10-26 - End : 2015-10-29
In the tradition of the series of Â»Potsdam ThinkshopsÂ«, we invite instrument specialists, observers, modellers, and theorists to exchange ideas, to stimulate discussion, to initiate future collaborations among participants, and to attract new users of instruments by showcasing the capabilities. The aim is to make progress towards a comprehensive description of solar eruptive events effectively aggregating their global properties as well as their highly dynamic fine structure.
Website:
https://thinkshop.aip.de/12/cms/

SEST/MiniMax Workshop in Mexico City, Mexico

Start : 2015-10-26 - End : 2015-10-30
The workshop is to improve the scientific understanding of the origin and propagation of solar transients, and develop the prediction capacity of these transients' arrival and potential impact on the Earth. The workshop engages coordinated international activities in observation, theory and modeling, and involves scientists in both developed and developing countries, and provides an online platform for educational opportunities for students.
Website:
http://cintli.geofisica.unam.mx/congreso/

2015 Sun-Climate Symposium in Savannah, Georgia, USA

Start : 2015-11-10 - End : 2015-11-13

Observations of the Sun and Earth from space have revolutionized our view and understanding about impacts of solar variability and anthropogenic forcing on Earth climate. For more than three solar cycles since 1978, the total and spectral solar irradiance (TSI and SSI) and global terrestrial atmosphere/surface have been observed continuously, enabling unprecedented quality data for Sun-climate studies. The primary objective of this symposium is to convene climate scientists, solar physicists, and experimentalists together for a better understanding how Earth climate system changes and responds to solar variability.
Website: http://lasp.colorado.edu/home/sorce/news-events/meetings/2015-sun-climate-symposium/

European Space Weather Week in Ostend, Belgium

Start : 2015-11-23 - End : 2015-11-27
The European Space Weather Week (ESWW) is the European forum for Space Weather users, forecasters, scientists and the involved industries, as proven by the high attendance to the ESWW 11 in November 2014.
The ESWW 12 will be held in Belgium in November, 23-27, 2015 and its organisation has already started and is benefiting from the experience and inputs from the past editions.
Website: http://stce.be/esww12/

AGU Chapman Conference on Currents in Geospace and Beyond in Dubrovnik, Croatia

Start : 2016-05-22 - End : 2016-05-27
Electric currents are fundamental to the structure and dynamics of space plasmas, including our own near-Earth space environment (also called "geospace"). This recognition is one of the great achievements in space research, going back to the beginning of the last century. With the current multi-spacecraft missions, such as Cluster, THEMIS and Swarm, we have unprecedented opportunities to unravel many of the intriguing puzzles about electric currents.
The conference will provide a forum in which various space science communities can come together to discuss recent achievements of observational, theoretical, and modelling studies. The emphasis will be on cross-disciplinary science sessions.
Website:
http://chapman.agu.org/spacecurrents/general-informationabout-conference/

41st COSPAR Scientific Assembly in Istanbul, Turkey

Start : 2016-07-30 - End : 2016-08-07
The 41st COSPAR Scientific Assembly will be held in Istanbul, Turkey from 30 July - 7 August 2016. This Assembly is open to all bona fide scientists.
Website:
https://www.cospar-assembly.org/

IAU Symposium 327: Fine Structure and Dynamics of the Solar Atmosphere in Cartagena de Indias, Colombia

Start : 2016-10-09 - End : 2016-10-13
The scientific goal of this symposium is to discuss recent results on the processes shaping the structure of the solar atmosphere and driving plasma eruptions and explosive events. Activity of the solar atmosphere entails numerous multi-scale processes. State-of-the-art solar instrumentation is revealing the dynamics of the Sun with unprecedented temporal and spatial resolutions. Together with advanced numerical simulations these investigations are making new steps in our understanding of the complex dynamical structure of the solar atmosphere.
Major unsolved problems of astrophysics such as how the solar corona is heated and how the solar wind and heliosphere are powered have their roots in the origin of small-scale magnetic fields constituting the Sun's 'magnetic carpet' in the photosphere and appearing as 'magnetic canopy' in the chromosphere.
Website:
http://www.iau.org/science/meetings/future/symposia/1160/