STCE Newsletter

23 Sep 2013 - 29 Sep 2013

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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.

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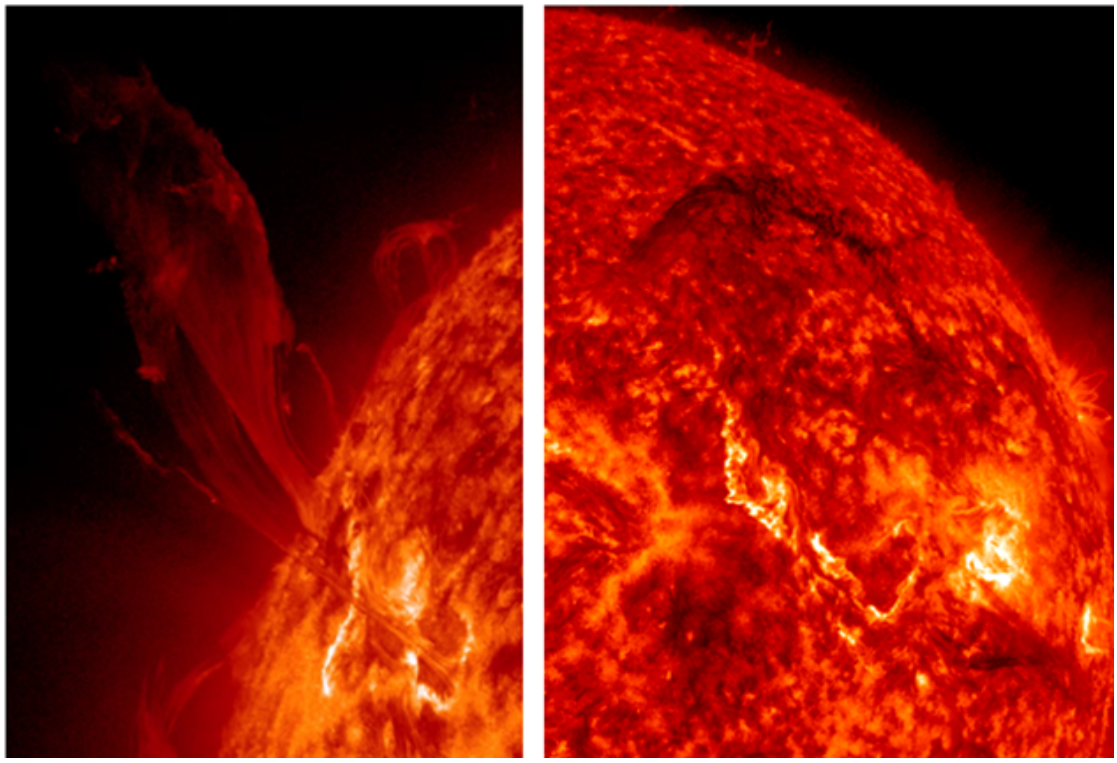
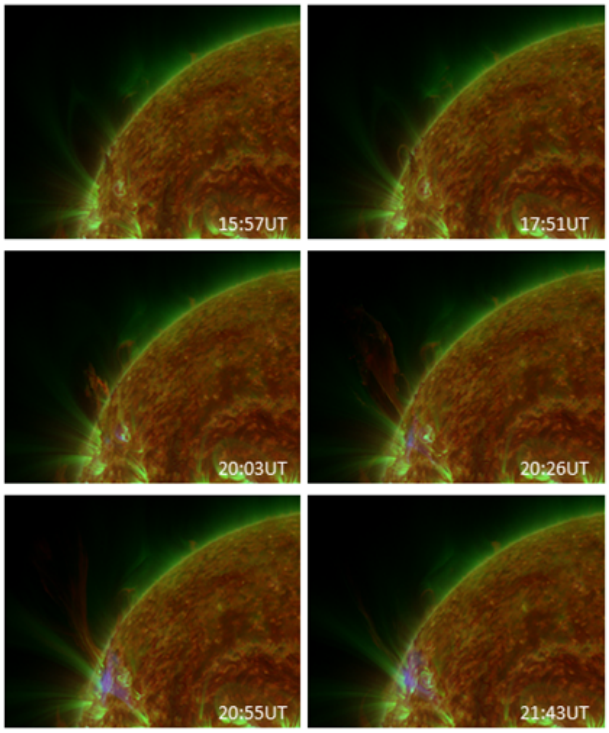
1. Two spectacular filament eruptions (23 Sep 2013 - 29 Sep 2013)

Once again, sunspot and related solar activity were very low last week. Nonetheless, the period featured two very nice eruptions during the evening hours of resp. 24 and 29 September. A movie of the events can be seen at http://www.youtube.com/watch?v=uf89aISuotk The images underneath show the eruptions as seen with the SDO/AIA 304 filter.

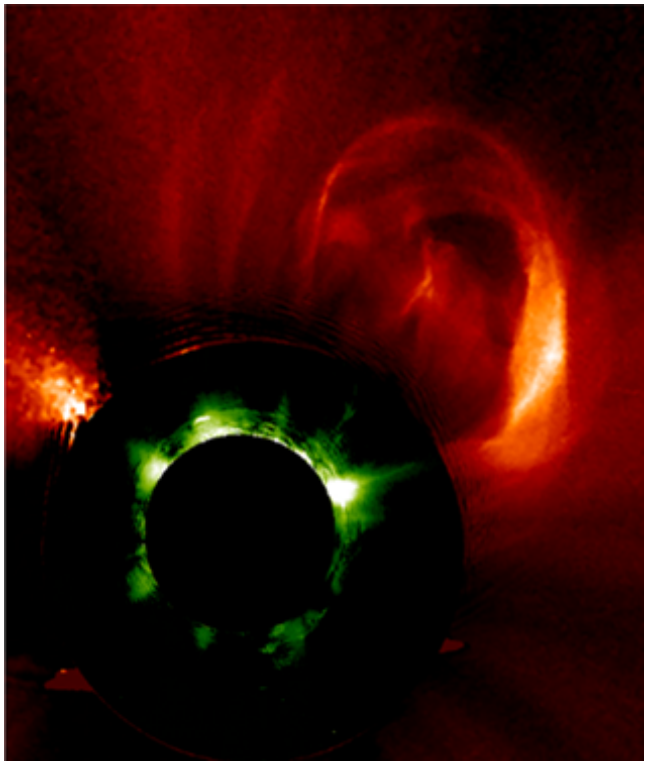
The 24 September eruption



Solar filaments are clouds of ionized gas above the solar surface squeezed between magnetic regions of opposite polarity. Being cooler and denser than the plasma underneath and their surroundings, they appear as dark lines when seen on the solar disk using special filters. At the solar limb, the same features shine bright over the solar limb and are called prominences. Some filaments are long and high enough such that part of it is at the same time visible as a prominence. These are called "filaproms", and the 24 September feature was just such a filaprom. See the top two images of the collage underneath, which are combination images from SDO/AIA 304, 171 and 094.



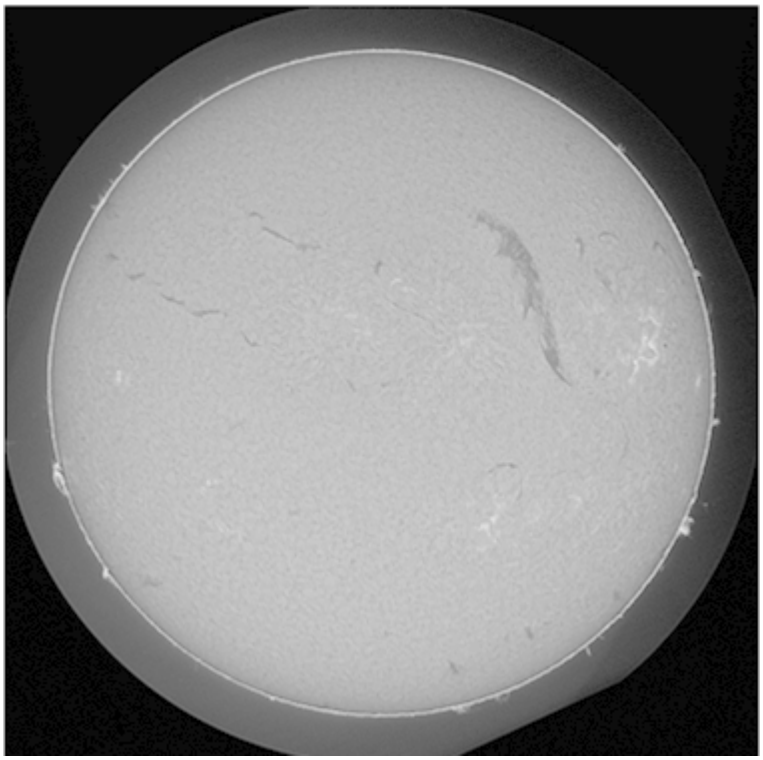
Around 18:30UT, some reconnection took place rendering the feature unstable and resulting in the eruption. At about 20:30UT, a solid pillar of charged particles towered an estimated 300,000 km above the solar surface. See the two middle images in the above collage.
At the same time, the magnetic field lines were also somewhat relaxing, transforming the solid tower into a wide, rotating fan. Part of the filament being ejected, the rest returned along the magnetic field lines crashing unto the solar surface (bottom two images in collage).



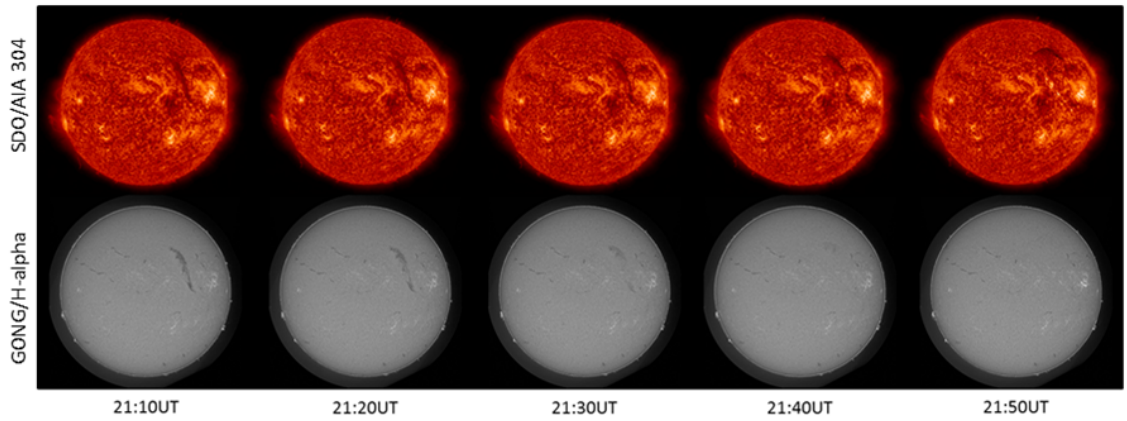
Not surprisingly, the eruption was associated to a coronal mass ejection (CME). No SOHO images were available at and shortly after the eruption, but STEREO-B observed the very nice CME from the backside of the Sun, as shown in the image above (21:50UT).

The 29 September eruption

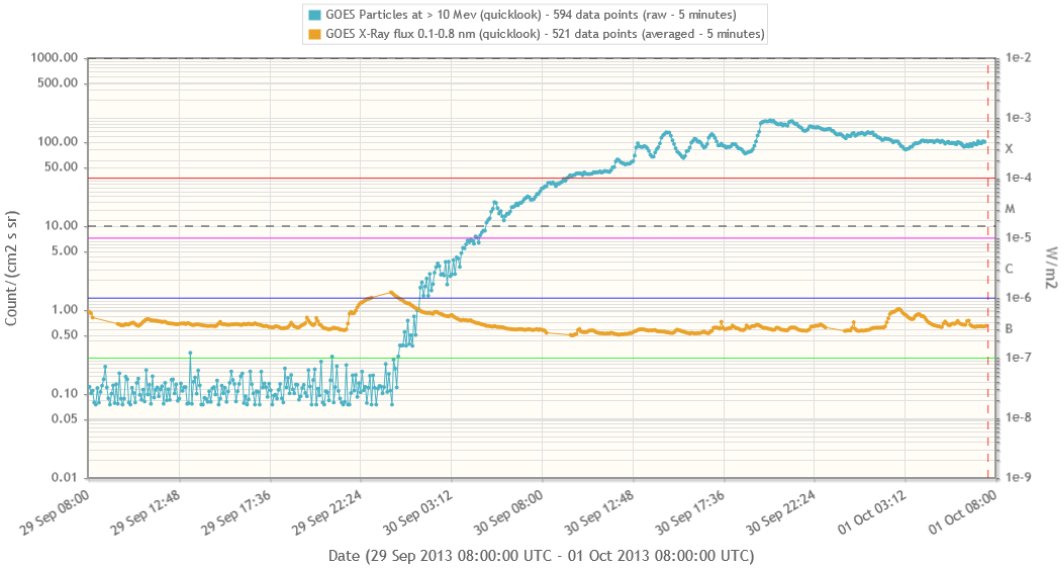
The source of the 29 September eruption was a long and solid filament in the northwestern solar quadrant. It had been transiting the solar disk since about 20 September, and gave the Sun a dark scar. Because of its length and solidness, space weather forecasters were expecting it to erupt.



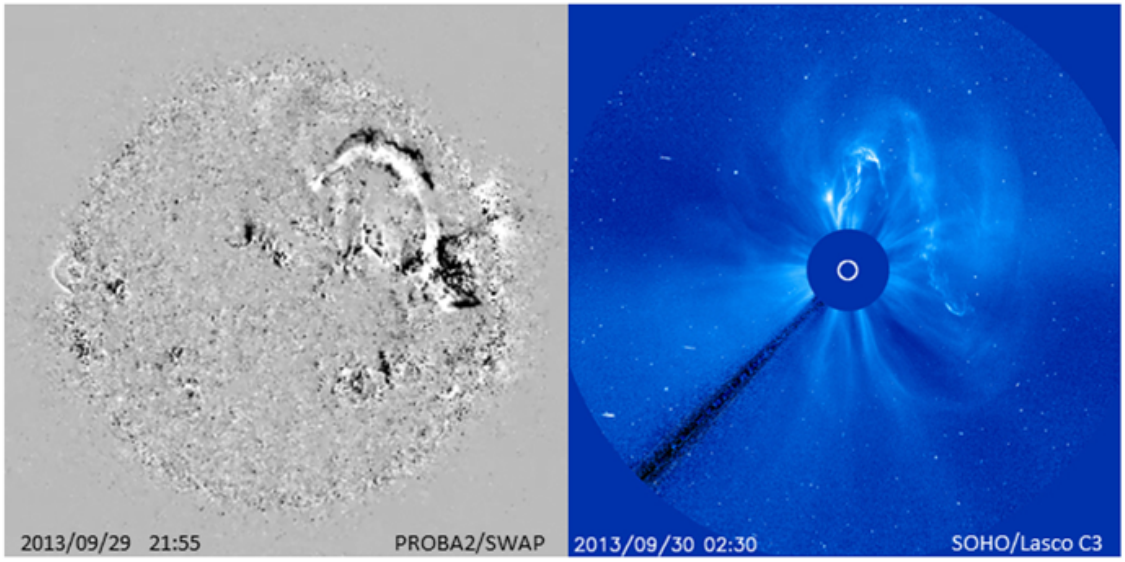
As shown in the images underneath, the filament became unstable and erupted around 21:30UT. The outlook of the eruption in H-alpha (filter showing the "cold" inner atmosphere of the Sun) was quite different from that in extreme ultraviolet (EUV). In EUV, the event could clearly be seen as an eruption, whereas in H-alpha, the eruption looked more like a sudden disappearance, which is actually the old name for this kind of events. The reason for this difference is in this case probably twofold.
First, the H-alpha filter is a very narrow spectral line. The speed of the ejected material may be high enough to shift it out of the filter line, effectively making the erupting material invisible in H-alpha. It's somewhat similar to your eyes not being able to see the wings of let's say a flying honeybee, though you can see them when the bee is sitting still.
The other reason for the different outlook is that the H-alpha filter has a temperature range that is a lot smaller than the AIA 304 filter. Indeed, H-alpha depicts the Sun's atmosphere close to about 10,000 degrees, but AIA 304 images the Sun at temperatures between 50,000-100,000 degrees. Hence, the heating from the eruption is enough to drive the filament temperature out of the H-alpha temperature range and thus to make the ejected filament plasma disappear in H-alpha images, whereas the erupting filament remained well visible in AIA 304 due to the broad temperature range of that filter.
Further research is required in order to determine which of the two aspects was the dominant one.



In contrast to the eruption 5 days earlier, the 29 September event resulted in a minor C-class x-ray flare (a so-called Hyder flare, albeit a weak one). It concerned a long duration event that started at 21:43UT, so about 15 minutes after the first visible signs of the eruption in H-alpha and EUV. The flare reached its maximum at 23:39UT and lasted 200 minutes (over 3 hours!). Numerous post-flare coronal loops were visible. Another difference was that this eruption was also associated to a moderate proton event. This was only the fifth such event this year.



It comes as no surprise that also this eruption was associated with a CME. This time, SOHO was able to observe the evolution of the spectacular CME in its entirety. It was moving with an estimated plane-of-sky speed of at least 900 km/s (STEREO-B images, core filament directed mainly towards the north). The ejected filament nicely preserved its shape as can be seen from this comparison between a PROBA2/SWAP difference image at 21:55 UT and a SOHO coronagraph image at 02:30UT. For STEREO-B, the eruption showed as a backside halo event, from which one could conclude that Earth might still receive a glancing blow 2-3 days later. As it turned out, Earth already received an impact from the CME during the early morning hours of 2 October, leading to moderate geomagnetic storm conditions. It was the first strong geomagnetic disturbance since late August (see the previous STCE Newsletter at http://stce.be/news/217/welcome.html).



Credit - Imagery for the images and movie were taken from SDO (http://sdo.gsfc.nasa.gov/data/), STEREO-B (http://stereo.gsfc.nasa.gov/), the GONG/H-alpha Network (http://halpha.nso.edu/), PROBA2 (http://proba2.oma.be/ssa) and SOHO (http://sohowww.nascom.nasa.gov/).

2. Best Proposal Award

From September 16 to 19, Leuven, Belgium was the scenery for an intensive training in solar-terrestrial physics. Around 40 participated, ranging from master students to PhD students and young post-doctoral researchers, taking the first steps in space research.
The eHEROES/CHARM school (http://wis.kuleuven.be/CHARM/events/school/SSTW2013/) focused on the theoretical approaches to space weather and its drivers, presented modern solar data analysis tools, and covered state-of-the-art solar and space science simulations. Participants learned about forecasting aspects and their quality control for space weather events, but also experience hands-on training in scientific proposal writing and received do-and-don't tips for scientific presentations. The lecturers were invariably expert scientists with international standing.

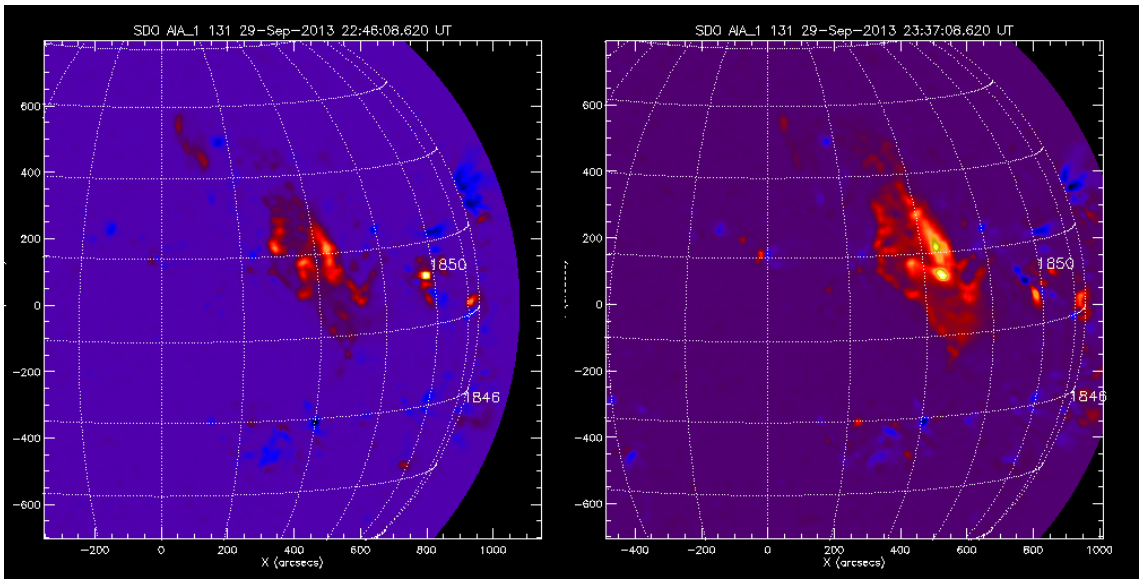
Bronze and Gold

On Tuesday, the audience was treated on an entertaining and appreciated lecture 'How to write a scientific proposal' by Caroline Greenman - the middle person in the picture - giving tips and tricks on academic writing. With these in mind, the students ventured writing their own proposal which got peer reviewed. The 'English at your best' teacher Caroline awarded the 3 best proposals. Among the winners were two STCE members: Michael Pieters (on the left) and his team got bronze for Global Solar Wind Modeling: MHD to Kinetic Treatments, gold went to Kris Borremans (on the right) and his colleague student for their Space Weather Forecasting model. Congratulations!

3. Review of solar and geomagnetic activity (23 Sep 2013 - 29 Sep 2013)

Solar Activity

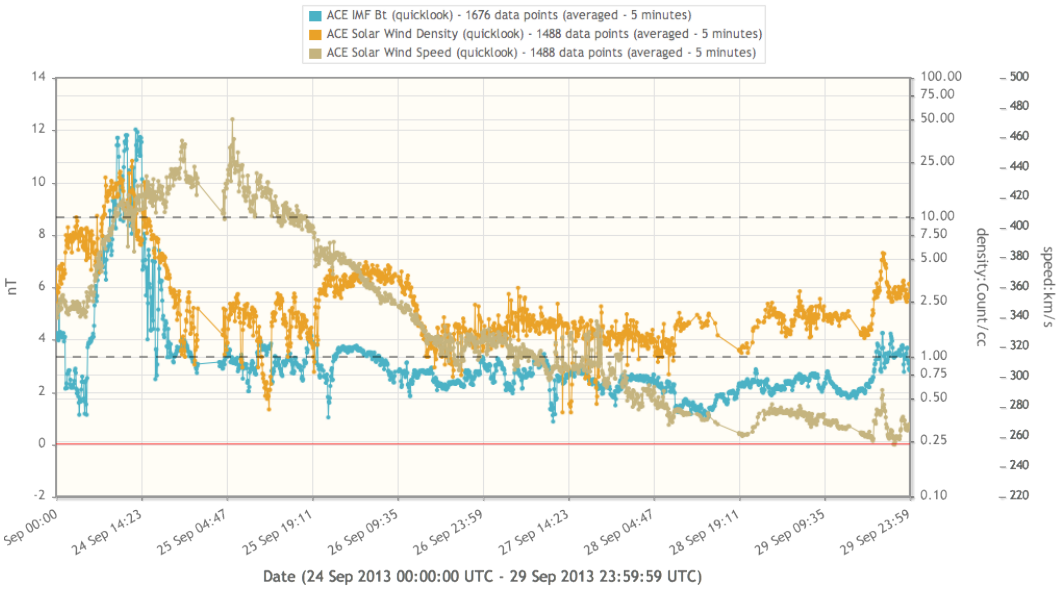
From September 23 to 28, NOAA AR 1850/Catania 83 was the main source of flaring activity which was situated in the B-level. The series of B-flares was interrupted by a C1.1 flare on September 24. The source region was this time NOAA AR 1846/Catania 79.
The only space weather relevant solar activity was seen on Sunday September 29. NOAA AR 1850/ Catania 83 fired of an C1.6 flare peaking at 05:25UT. No big deal, wasn't it that this region was the neighbour of a large filament that erupted during the last part of September 29. A C1.2 flare peaking at 23:23UT was associated with the plasma eruption. The longitudinal filament had reached the central meridian on September 26.
The pictures below are difference image of SDO/AIA 131: two subsequent images are subtracted showing the differences between them. The part that light up is the place where the 131 Angstrom radiation is much stronger compared with the rest of the solar disk. It gives the flare location. You see that NOAA 1890/Catania 83 is a partner in crime.



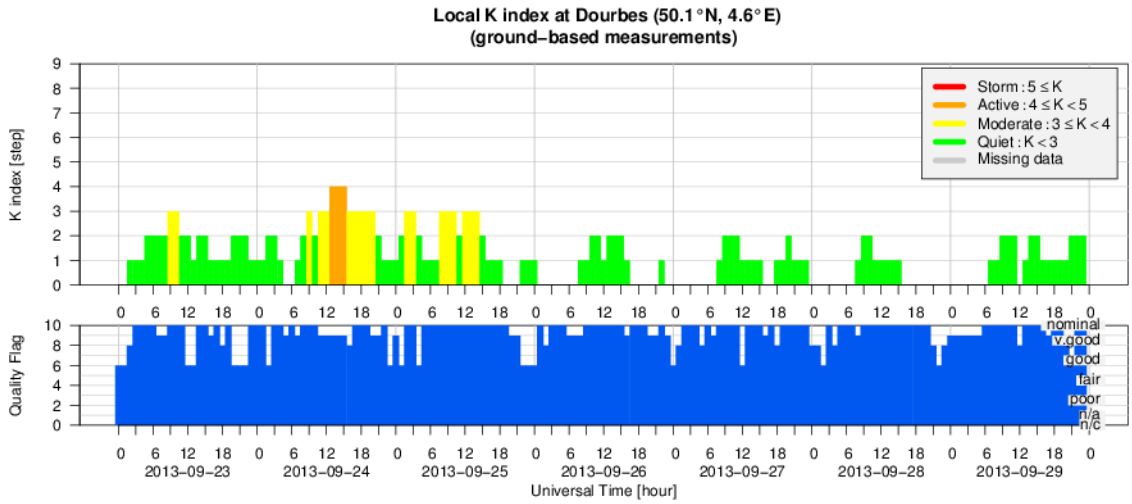
Geomagnetic Activity

The geomagnetic field was not disturbed at all with the exception of one day: September 24. That day, ACE data show the arrival of a co-rotating interaction region (CIR) with a magnetic field slightly larger than 10nT and a more dense plasma, >10 particles/cm3. The solar wind speed increased almost simultaneously. The bump in the solar wind speed curve reached a value around 450 km/s. It took this plasma around 4 days to bridge the distance Sun-Earth. On September 20, a northern coronal hole passed the central meridian. The CIR followed by the fast wind is probably linked to this hole. The CIR was responsible for 1 interval of Kp=4 on September 24.
From September 25, the solar wind speed decreased. The lowest value was reached on September 30: slightly below 250 km/s.

The CIR and the decrease in solar wind speed are visible in the graph below showing three solar wind parameters measured by ACE at the L1 point: speed, density and total magnetic field.



4. Geomagnetic Observations at Dourbes (23 Sep 2013 - 29 Sep 2013)



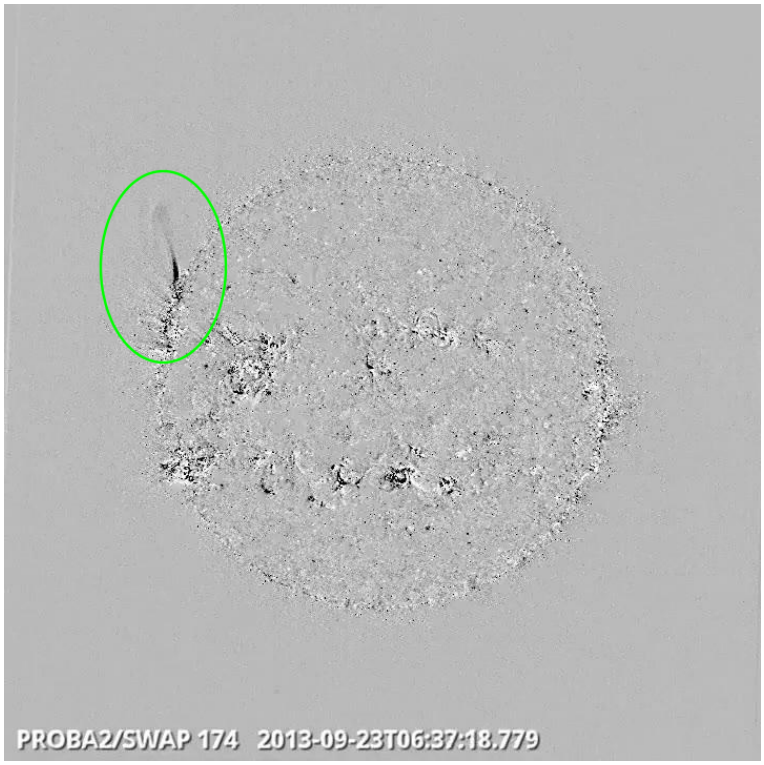
5. PROBA2 Observations (23 Sep 2013 - 29 Sep 2013)

Solar Activity

Solar (flaring) activity was low to very low throughout 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 (SWAP174; HelioViewer.org).

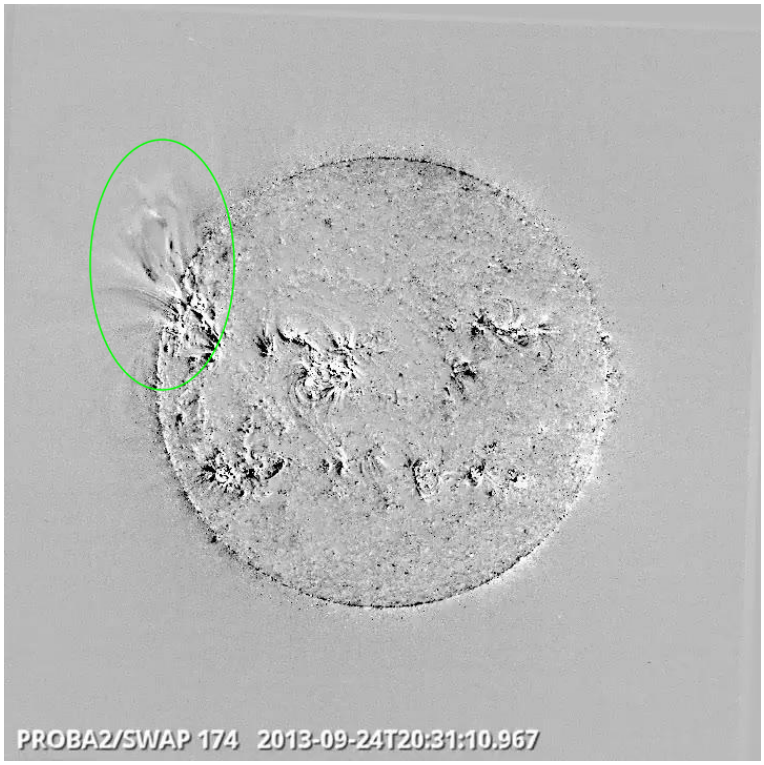
Details about some of this week's events, can be found further below.

Monday September 23th:



Eruption on North East limb @ 06:37 UT SWAP difference image

Tuesday September 24th:



Eruption on North East quad @ 20:31 UT SWAP difference image
Find a movie of the complete event here (SWAP difference movie)
http://proba2.oma.be/swap/data/mpg/movies/WeeklyReportMovies/WR183_Sep23toSep29/Events/20130924_Eruption_NorthEast_2031_swap_diff.mp4

Wednesday September 25th:

Eruption on South West quad @ 19:03 UT SWAP difference image

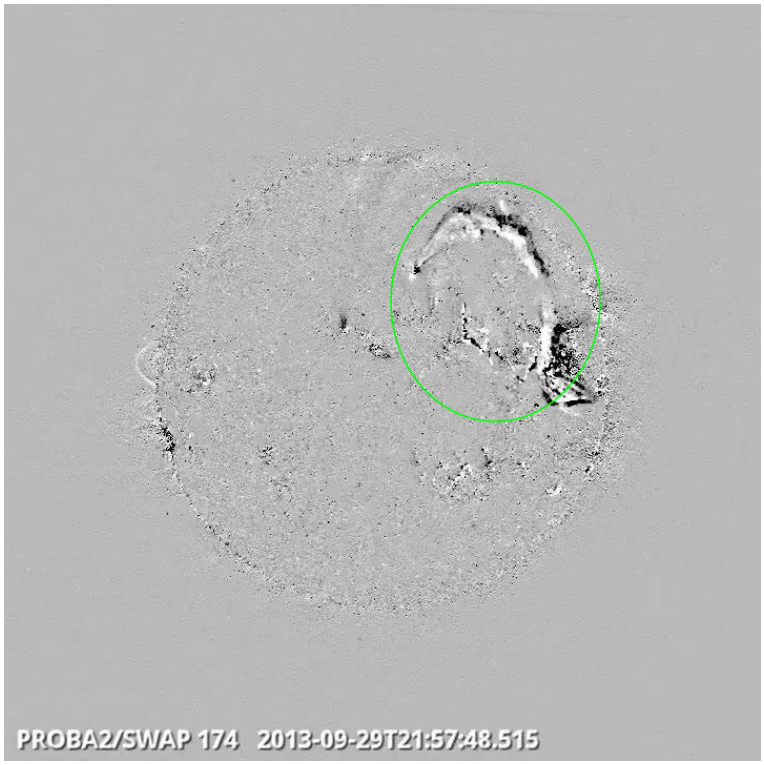
Saturday September 28th:

Prominence eruption on East limb @ 10:36 UT SWAP difference image
Find a movie of the complete event here (SWAP difference movie) The movie also contains a small Eruption preceding this event
http://proba2.oma.be/swap/data/mpg/movies/WeeklyReportMovies/WR183_Sep23toSep29/Events/20130928_PromEruptions_SouthWest_0944_EastLimb_1036_swap_diff.mp4

Sunday September 29th:

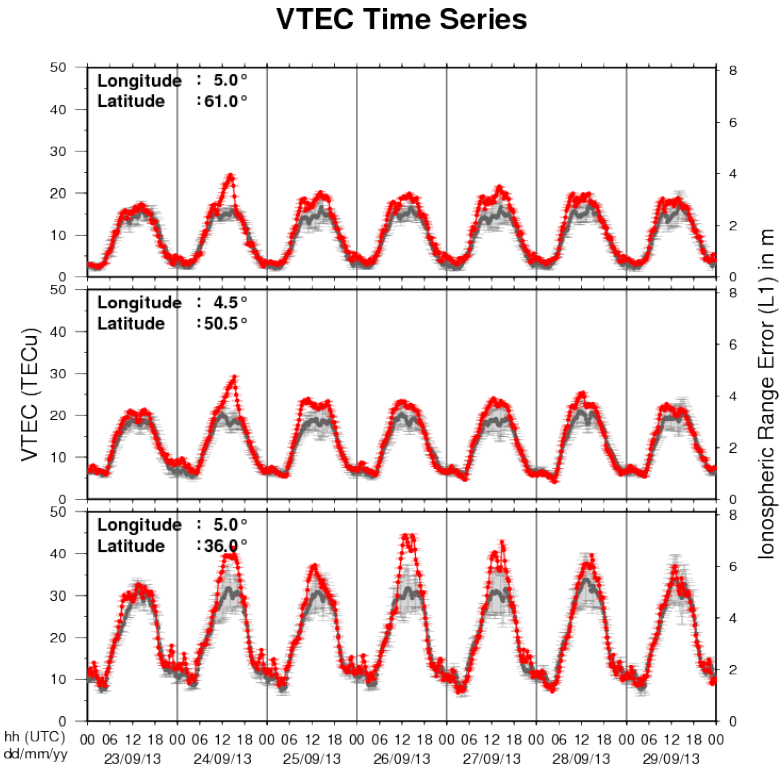
Prominence eruption on East limb @ 07:20 UT SWAP difference image
Find a movie of the complete event here (SWAP difference movie)
http://proba2.oma.be/swap/data/mpg/movies/WeeklyReportMovies/WR183_Sep23toSep29/Events/20130929_PromEruption_EastLimb_0720_swap_diff.mp4

Prominence eruption on East Limb @ 11:05 UT SWAP difference image
Find a movie of the complete event here (SWAP difference movie)
http://proba2.oma.be/swap/data/mpg/movies/WeeklyReportMovies/WR183_Sep23toSep29/Events/20130929_PromEruption_EastLimb_1105_swap_diff.mp4



Filament eruption on North West quad @ 21:57 UT SWAP difference image
Find a movie of the complete event here (SWAP difference movie)
http://proba2.oma.be/swap/data/mpg/movies/WeeklyReportMovies/WR183_Sep23toSep29/Events/20130929_FilamEruption_NorthWest_2157_swap_diff.mp4

6. Review of ionospheric activity (23 Sep 2013 - 29 Sep 2013)



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

7. Future Events

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

STEREO/WAVES & WIND/WAVES workshop on Solar Radio Emissions on Santorini, Greece

Start : 2013-10-07 - End : 2013-10-11

The aim of the workshop is to review the "state of the art" theories about generation and propagation of Solar radio burst and discuss the observational constrains and results that have been provided in this area by the WIND & STEREO missions during the last 20 years. Furthermore the STEREO & WIND observations will be put in the context of other missions such as RHESSI and ground based observatories. Finally, the preparation for the future explorations foreseen with Solar Orbiter and Solar Probe Plus will be discussed.
Website:
http://type3stereo.sciencesconf.org/

2nd Asian-Pacific Solar Physics Meeting, in Hangzhou, China

Start : 2013-10-24 - End : 2013-10-26
Initiated by Profs. Fang and Choudhury, the first Asian-Pacific Solar Physics Meeting (APSPM) was held in Bangalore two years ago. During the meeting, a consensus was achieved that it might be a good idea to have the APSPM every three years. Somehow the second APSPM was proposed to be held by mainland China in 2013. APSPM is aimed to exchange the recent research results in solar physics in the emerging asian-pacific region.
Asian-pacific regions are getting more and more active in solar physics, as signified by the construction of big facilities, including the Hinode satellite (Japan), SOXS (India), Chinese Solar Radio Heliogragh, and Optical & Near-Infrared Solar Eruption Tracer (ONSET). Therefore, colleagues have agreed to hold regional solar physics meetings regularly. The first Asian-Pacific Solar Physics Meeting (APSPM) was held in Bangalore during March 22-24 2011. During the meeting, a consensus was achieved that it might be a good idea to have the APSPM every three years. Somehow the second APSPM was proposed to be held by mainland China in 2013. APSPM is aimed to exchange the recent research results in solar physics in the emerging asian-pacific region.
Website:
http://sdac.nju.edu.cn/~solar/

Helicity Thinkshop on Solar Physics in Beijing, China

Start : 2013-10-27 - End : 2013-10-31
Magnetic helicity has been intensively studied from observational, theoretical, and many other aspects of solar physics. For this meeting we would like to invite solar physicists who are interested in the observational and theoretical studies of the helicity, to encourage thorough discussions on the relevant hot issues. The 1st Helicity Thinkshop was held successfully in 2009, and now the 2nd one will be held on October 27-31, 2013 in Beijing, China.
Website:
http://sun.bao.ac.cn/meetings/HT2013/

Workshop and School on Radio Sun in Zhengxiangbaiqi, Inner Mongolia, and Beijing, China

Start : 2013-10-28 - End : 2013-11-02
The Worshop and School on Radio Sun in Beijing and Inner Mongolia during Oct.28 - Nov. 2, 2013 is the first international academic seminar supported by the International Research Staff Exchange Scheme of the Seventh Fromework Programme of the European Union (FP7-IRSES-295272-RADIOSUN).
The primary aim of this programme is to establish close research interaction and collaboration between the key research groups involved in CSRH, SSRT, and ALMA projects and in development of relevant theory and data analysis tools, through the systematic research staff and knowledge exchange, joint research efforts exploiting existing data and facilities, and preparing the future world-class partnership in exploitation of the upcoming facilities.
The Workshop and School welcome all solar physicsts and students who are interested in solar radio astronomy to participate. We will discuss and exchange the scientific frontier problems, including the new-generation radio instruments (CSRH, Siberian multi-frequency radioheliograph, LOFAR, ALMA, and other new instruments), recent achievements and their scientific goals; methods and techniques of data

processing (for example, software, radio image reconstructions, and method for studying various types of solar radio fine structures); and the objectives of new observational data and new mathematical methods.
Website:
http://beijingradiosun.csp.escience.cn/

25th Winter School of Astrophysics: Cosmic Magnetic Fields, in La Laguna, Tenerife, Spain.

Start : 2013-11-11 - End : 2013-11-22
Magnetic fields play an important role in many astrophysical processes. But magnetic are difficult to detect and to model or understand, since the fundamental equations describing the behavior of magnetized plasmas are highly non-linear. Hence, magnetic fields are often an inconvenient subject which is overlooked or simply neglected. Such difficulty burdens the research on magnetic fields, which has evolved to become a very technical subject, with many small disconnected communities studying specific aspects and details.
The school tries to amend the situation by providing a unifying view of the subject. The students would have a chance to understand the behavior of magnetic fields in all astrophysical contexts, from cosmology to the Sun. From star-bursting regions to AGNs in galaxies. The school will present a balanced yet complete review of our knowledge. Extensions into the unknown are also important to indicate present and future lines of research.
The Winter School will bring together in a relaxed working atmosphere a number of the leading scientists in this field, PhD students and recent postdocs. The conditions for a successful interaction will be granted, including two special sessions for those students that want to present their own work.
Website:
http://www.iac.es/winterschool/2013/

7th Hinode science meeting in Takayama, Japan

Start : 2013-11-12 - End : 2013-11-15
Since its launch in Sep-2006, more than 600 refereed papers have been published based on Hinode observations, presenting many new and important findings to the scientific community. However, due to the unexpectedly low levels of solar activity, until now the focus has mainly been on the more quiescent aspects of the solar cycle. With the solar maximum expected this year, through cooperative observations with SDO, IRIS, and ground based observatories, Hinode observations should lead to our understanding of active Sun phenomena, such as solar flares and CMEs, to be greatly improved. Making Hinode-7 an excellent opportunity to discuss solar activity in the current solar cycle and the related science through the use Hinode data, as well as other solar/space weather data. It will also be interesting to use this meeting to broaden our focus to include the solar-stellar connection as a means to deepen our understanding of solar activity.
Momentum is also gaining for Solar-C, which is being developed as an international collaboration between Japan, US and Europe. To further discuss this mission, the Solar-C science meeting will be held on 11-Nov.
Website:
http://www.kwasan.kyoto-u.ac.jp/hinode-7/

Space Weather: the importance of observations in London, UK

Start : 2013-11-13 - End : 2013-11-13
Most space weather occurs due to the Sun's emissions which can affect the Earth's space environment. Modern society is ever more dependent upon ground-based & spaceborne technology which can be vulnerable to space weather. Satellites, GPS, aviation & the electric power industry are all at risk from this & hence space weather is now included on the UK's National Risk Register. It is important to have long-running, continuous observations for forecasting, nowcasting & for research in space weather. This public meeting, held during the peak of the 11 year solar cycle, addresses the deficiency in continuous, long-term observations & how this might be overcome.
Website:

http://www.rmets.org/events/space-weather-importance-observations

International CAWSES-II Symposium in Nagoya, Japan

Start : 2013-11-18 - End : 2013-11-22
This International CAWSES-II Symposium hosted by SCOSTEP (Scientific Committee on Solar-Terrestrial Physics) will provide an excellent opportunity to discuss the scientific accomplishments of CAWSES-II and look forward to SCOSTEP's future programs at a moment toward the end of its five-year period. The symposium will cover the six major themes of CAWSES-II tasks: 1) What are the solar influences on the Earth's climate?, 2) How will geospace respond to an altered climate?, 3) How does short-term solar variability affect the geospace environment?, 4) What is the geospace response to variable inputs from the lower atmosphere?, 5) Capacity Building, 6) Informatics and eScience. The main functions of CAWSES-II are to help coordinate international activities in observations, modeling, and applications crucial to achieving this understanding, to involve scientists in both developed and developing countries, and to provide educational opportunities for students of all levels. The symposium offers keynotes/lectures that will be interesting for all participants every morning and more specific sessions of presentations in the afternoon. We welcome all those who are involved and/or interested in CAWSES-II to Nagoya in the autumn when we will have the pleasure of being surrounded by beautiful colorful leaves of this season.
Website:
http://www.cawses.org/CAWSES/leaflet_CAWSES-II_120229.pdf

European Space Weather Week in Belgium

Start : 2013-11-18 - End : 2013-11-22
The 10th Edition of the European Space Weather Week will take place on 18-22nd November 2013 in Belgium. The venue will be confirmed early next year, but mark your calendars now for the 10th Anniversary of this growing European event.
The ESWW will again adopt the central aim of bringing together the diverse groups in Europe working on different aspects of Space Weather . This includes but isn't limited to the scientific community, the engineering community, applications developers, service providers and service end users. The meeting organisation will again be coordinated by the Belgian Solar-Terrestrial Centre of Excellence (STCE), ESA and the Space Weather Working Team. The local organisation will be done by the STCE.
Website:
http://www.stce.be/esww10/

1st SPRING Workshop in Freiburg, Germany

Start : 2013-11-26 - End : 2013-11-28
The 1st SPRING (Solar Physics Research Integrated Network Group) workshop is being held from November 26 - 28, 2013 at the scenic Brugger's Hotel Park by Titisee hosted by the Kiepenheuer-Institut fÃ¼r Sonnenphysik in Freiburg, Germany.
The purpose of the workshop is to work on the scientific requirements for a new ground-based network of telescopes for full-disk synoptic observations of the Sun.
The desire for such a new network is motivated by new scientific research directions in solar physics, the requirement of real-time context data for high-resolution solar telescopes, and the need of continuous, long-term, consistent, and reliable solar data as foundation for space weather prediction.
Website:
http://www3.kis.uni-freiburg.de/~mroth/spring.html

Space Weather: a Dialogue between Scientists and Forecasters in London, UK

Start : 2013-12-13 - End : 2013-12-13
The inclusion of space weather in the National Risk Assessment in 2012 means that there is now an urgent need for dialogue between those doing the science of space weather and those using the data to forecast, understand and mitigate the risks.

Since the Sun is currently at the peak of its cycle - a time when space weather events become more frequent - we have a timely opportunity to study how a range of solar activity ultimately lead to magnetospheric, ionospheric and ground level disturbances.
The goal of this meeting is to bring together those working across the broad range of space weather activities in the UK to discuss the current status of observations and recent new advances in the theories and models of the phenomena of space weather.
Website:
http://www.mssl.ucl.ac.uk/~lmg/spaceweather/Overview.html

Solar and Stellar Flares, in Prague, Czech Republic

Start : 2014-06-23 - End : 2014-06-27
The meeting in honour of Prof. Zdenek Svestka will cover issues of the physics of solar and stellar flares.
Website:
http://solarflares2014.cz/

40th COSPAR Scientific Assembly in Moscow, Russia

Start : 2014-08-02 - End : 2014-08-10
The 40th COSPAR Scientific Assembly will be held in Moscow, Russia from 2 - 10 August 2014. This Assembly is open to all bona fide scientists.
Website:
http://www.cospar-assembly.org/

International Chapman Conference on Low-Frequency Waves in Space Plasmas on Jeju Island, South Korea

Start : 2014-08-31 - End : 2014-09-05
Low-frequency waves (ULF, ELF and VLF) in space plasmas have been studied for many decades. In our solar system, such waves occur in the magnetospheres of planets and in the solar wind; more recently they have also been confirmed on the Sun. In spite of the great differences in the plasma properties of these regions, the overarching schemes are wave generation, wave propagation, and wave dissipation, which are three fundamental aspects of any kind of waves. A fourth aspect of these waves is their application, either with direct benefit to humans or for scientific pursuit. Therefore, this Chapman conference will provide a forum in which various wave communities can come together and discuss recent achievements of observational, theoretical, and modeling studies.
Website:
http://chapman.agu.org/spaceplasmas/

14th European Solar Physics Meeting in Dublin, Ireland.

Start : 2014-09-08 - End : 2014-09-12
The European Solar Physics Meetings aim to highlight all aspects of modern solar physics, including observation and theory that span from the interior of the Sun out into the wider heliosphere. These meetings provide a broad, yet stimulating, environment for European and international scientists to share their research in solar physics.
The meeting will mostly comprise of contributed talks and poster presentations, with several invited review talks (typically one per session). Posters will be on display for the whole meeting in close proximity to the lecture theatre. Refreshments will be served in the poster viewing area during two dedicated coffee/poster breaks on each full day.
Website: http://www.espm14.ie/

Solar Wind 14 in Weihai, China

Start : 2015-06-22 - End : 2015-06-26
The Fourteenth International Solar Wind Conference will be held for the first time ever in China, from 22 to 26 June 2015, at Weihai in the Shandong province. It will be jointly organized by the School of Earth and Space Sciences of Peking University and the newly-established Institute of Space Sciences of

Shandong University. The meeting will take place in the Space Science Building of Shandong University, a venue located within walking distance to the beautiful Weihai International Bathing Beach, one of the most popular scenic areas of northern China.
The conference will cover all aspects of solar wind physics, with invited reviews and contributed papers that examine the current research and outline the future research in all the relevant solar wind fields.
Website: not available yet