STCE Newsletter

2 Feb 2015 - 8 Feb 2015

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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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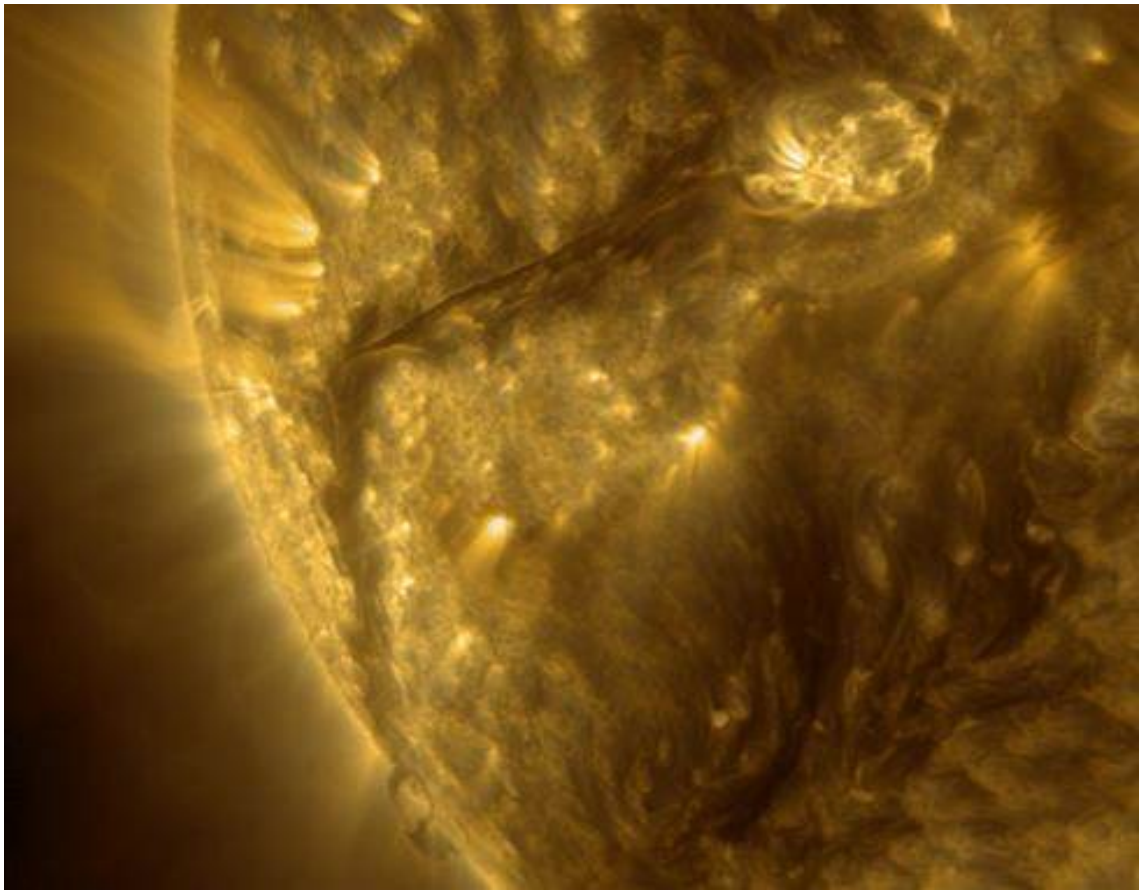
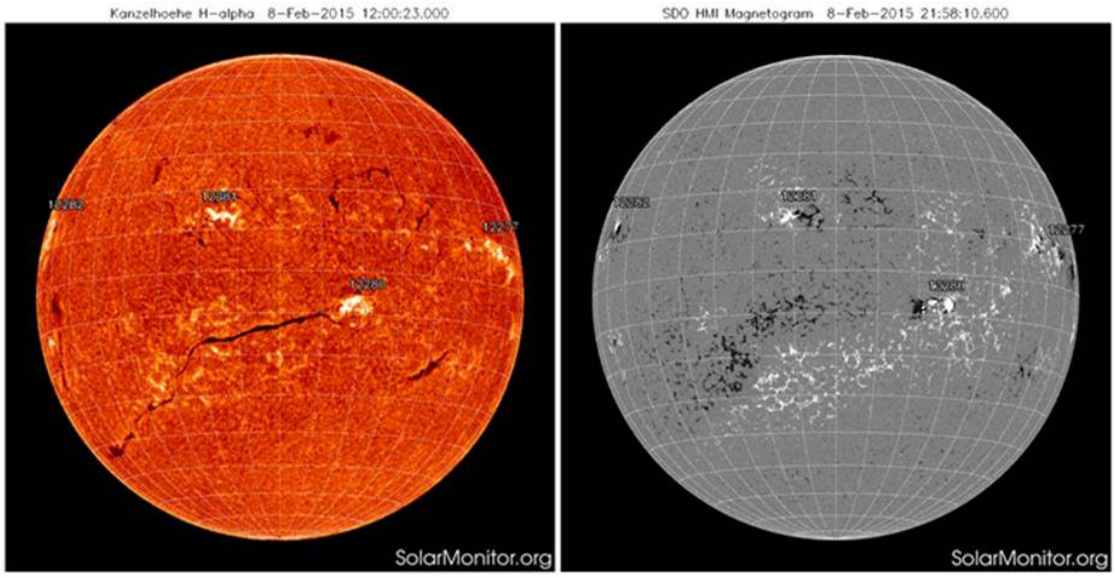
1. A looooong filament

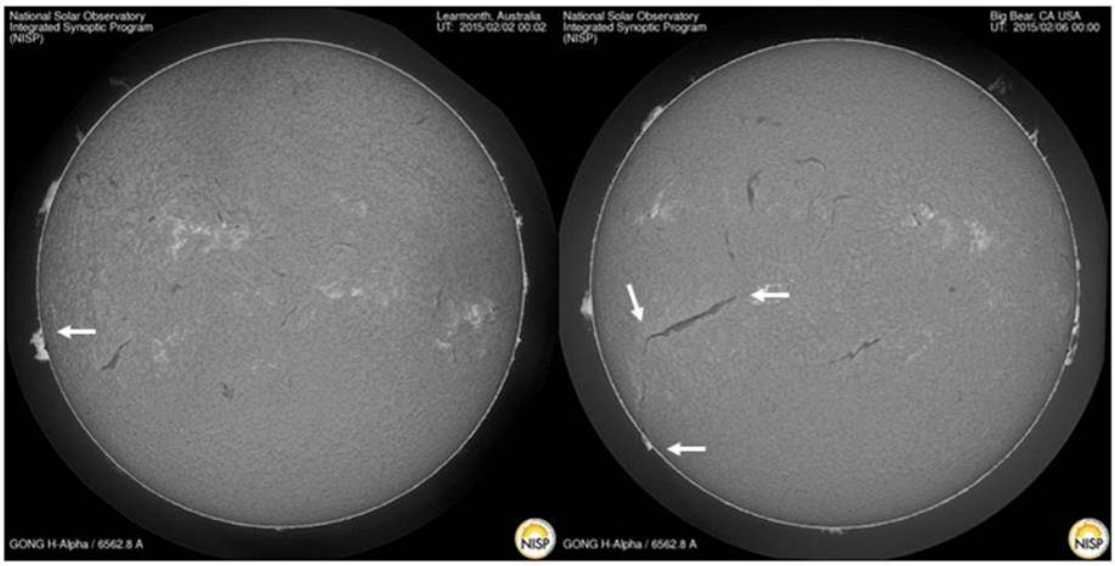
A movie of the transit of the filament and its almost eruption on 04 February 2015 in both H-alpha and EUV is available at http://youtu.be/A_YNsU1nZ2E



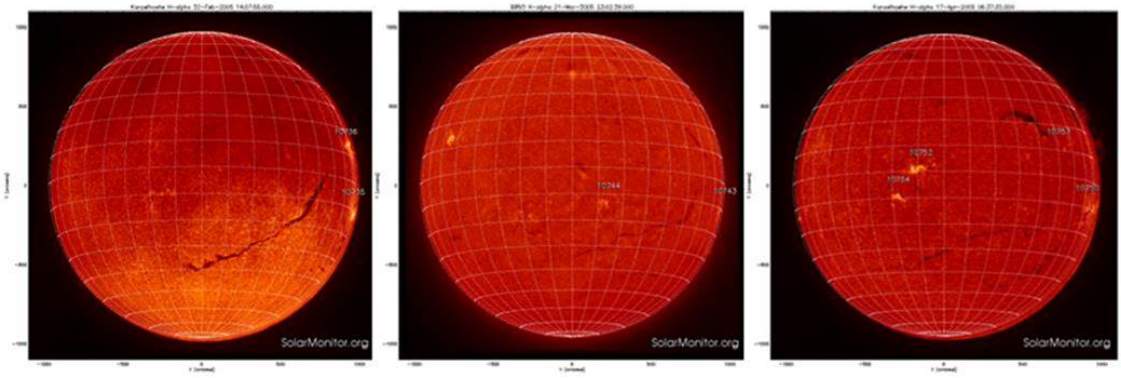
Solar filaments are clouds of ionized gas above the solar surface squeezed between magnetic regions of opposite polarity. Being cooler and denser than the plasma underneath and their surroundings, they appear as dark lines when seen on the solar disk and as bright blobs when seen near the solar limb (then they are called "prominences"). Special filters are required to observe these features, and one such a filter is the Hydrogen alpha (H-alpha) line in the red part of the solar spectrum. It shows the cool inner atmosphere of the Sun. The image underneath at left shows a very long filament that started to transit the Sun early last week. It neatly fills the transition zone between the two large patches of opposite magnetic polarity as can be seen on the image to the right: black (negative) on the left (east), white (positive) on the right (west).



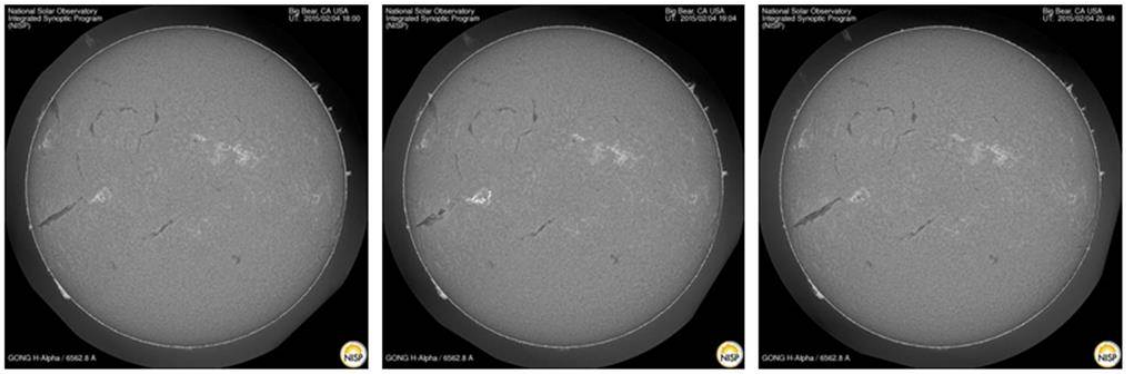
This filament started to appear around 02 February at the east limb. Gradually, the solar rotation moved it further onto the earth-facing solar hemisphere. It was so long that it took almost a full week before it could be seen in its entirety. It was well over 1 million km long, or the equivalent of at least 2.5 times the Earth-Moon distance. The height of the filament appears to correspond to about 3.5 Earth diameters (+/- 43.000 km), which is no exceptional value.



However, the length of the filament is something we do not see every day, but it is also not the first time we see such a long structure. For example, a slightly shorter filament was visible early 2005 and lasted for over 3 full solar rotations. The images underneath show the filament on 22 February, 21 March, and 17 April 2005. Other examples of (very) long filaments were discussed in this STCE news item at http://www.stce.be/news/203/welcome.html



Though most of these long filaments eventually erupt, this does not necessarily have to be the case. A lot depends on the stability of the surrounding magnetic fields. The presence and flaring activity in nearby active regions may disturb these fields and these destabilize the filament which may then erupt. Interestingly, in this case, there is an active region (NOAA 12280) at the west end of the filament. Early this week, the filament hardly survived a not so strong flare from this region. The C3 flare peaked at 19:12UT on 04 February and destabilized a substantial part of the filament. However, in just an hour or two, the filament reshaped itself. See this news item at http://www.stce.be/news/155/welcome.html for other examples.



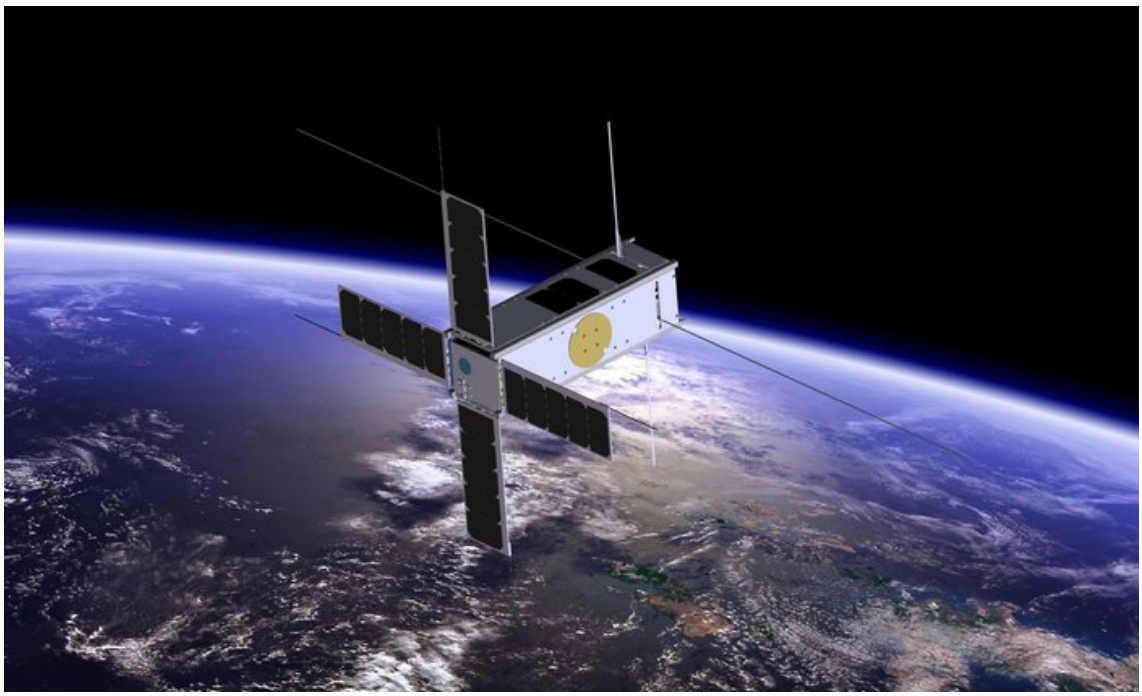
04 Feb 2015 – 18:00UT 04 Feb 2015 – 19:04UT 04 Feb 2015 – 20:48UT

Hot off the press - The southeastern ("lower left") part of the filament graciously erupted during the evening hours of 11 February. The eruption was not associated to an obvious x-ray flare or proton flux enhancement. Current coronagraphic images reveal no obvious coronal mass ejection.

Credits - Images for the movie clips were taken from the GONG H-alpha Network (http://halpha.nso.edu/), SDO (http://sdo.gsfc.nasa.gov/data/aiahmi/), and (J)Helioviewer (http://helioviewer.org/).

2. Picasso painting the earth's atmosphere

Small, smaller ... next to washing machine sized micro-satellites, there exist pico-satellites. The Belgian Institute for Space Aeronomy, BIRA-IASB, together with Centre Spatial de Liege, CSL is building one of a network of 50 CubeSats. The satellite is baptised PICASSO: PICosatellite for Atmospheric and Space Science Observations and it will explore the earth atmospheric layers where no man has explored. This is exciting, but it is even more exciting that these observations are done with such a small satellite. If this technological mission proves to be successful, it opens to door for more similar and cheap missions.



Launch is foreseen in 2016, so one year of patience before this thrilling episode can start.

Meer - Nederlands
http://www.esa.int/dut/ESA_in_your_country/Belgium_-_Nederlands/Belgisch_Instituut_voor_Ruimte-Aeronomie_gaat_ozonlaag_en_ionosfeer_bestuderen_met_picosatelliet_PICASSO

Plus - Francais
http://www.esa.int/fre/ESA_in_your_country/Belgium_-_Francais/L_Institut_d_aeronomie_spatiale_de_Belgique_veut_demontrer_la_possibilite_d_etudier_la_couche_d_ozone_et_l_ionosphere_avec_un_petit_satellite_PICASSO

More - English (short version)
http://www.esa.int/spaceinimages/Images/2015/01/Picasso_CubeSat2

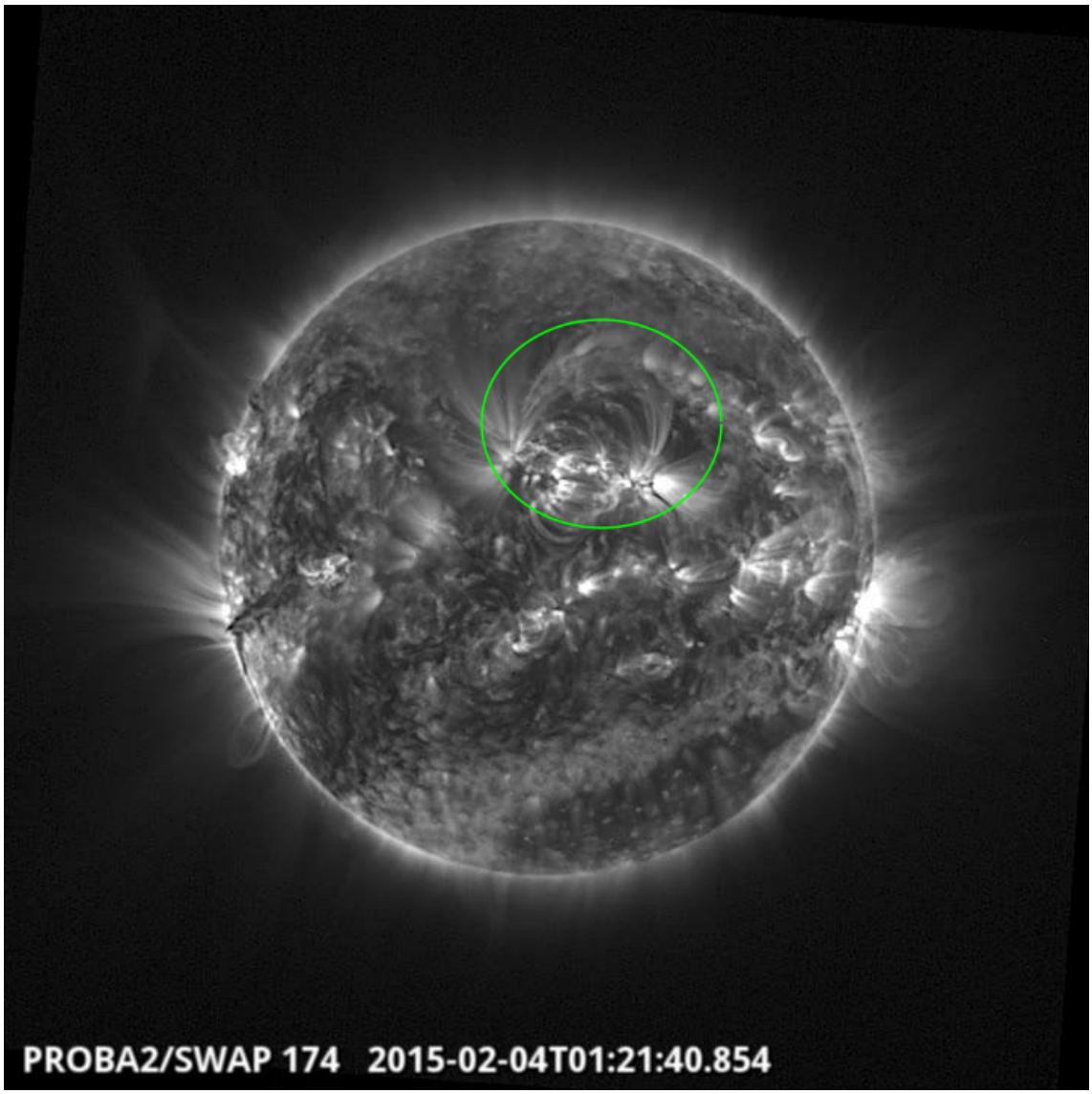
3. PROBA2 Observations (2 Feb 2015 - 8 Feb 2015)

Solar Activity

Solar flare activity fluctuated between 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

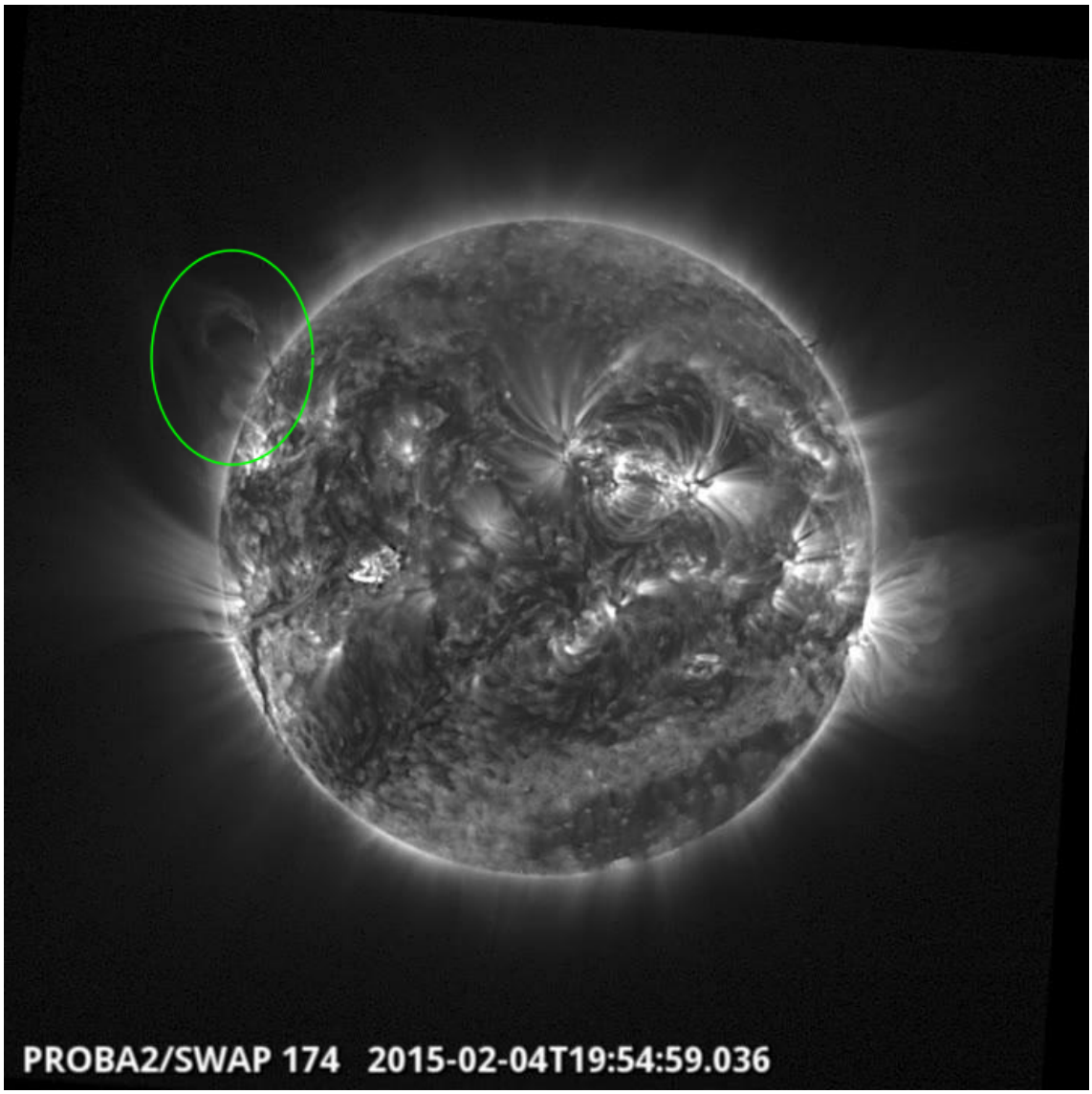
This page also lists the recorded flaring events.
A weekly overview movie can be found here (SWAP week 254).
http://proba2.oma.be/swap/data/mpg/movies/weekly_movies/weekly_movie_2015_02_02.mp4
Details about some of this week's events, can be found further below.

Wednesday Feb 04

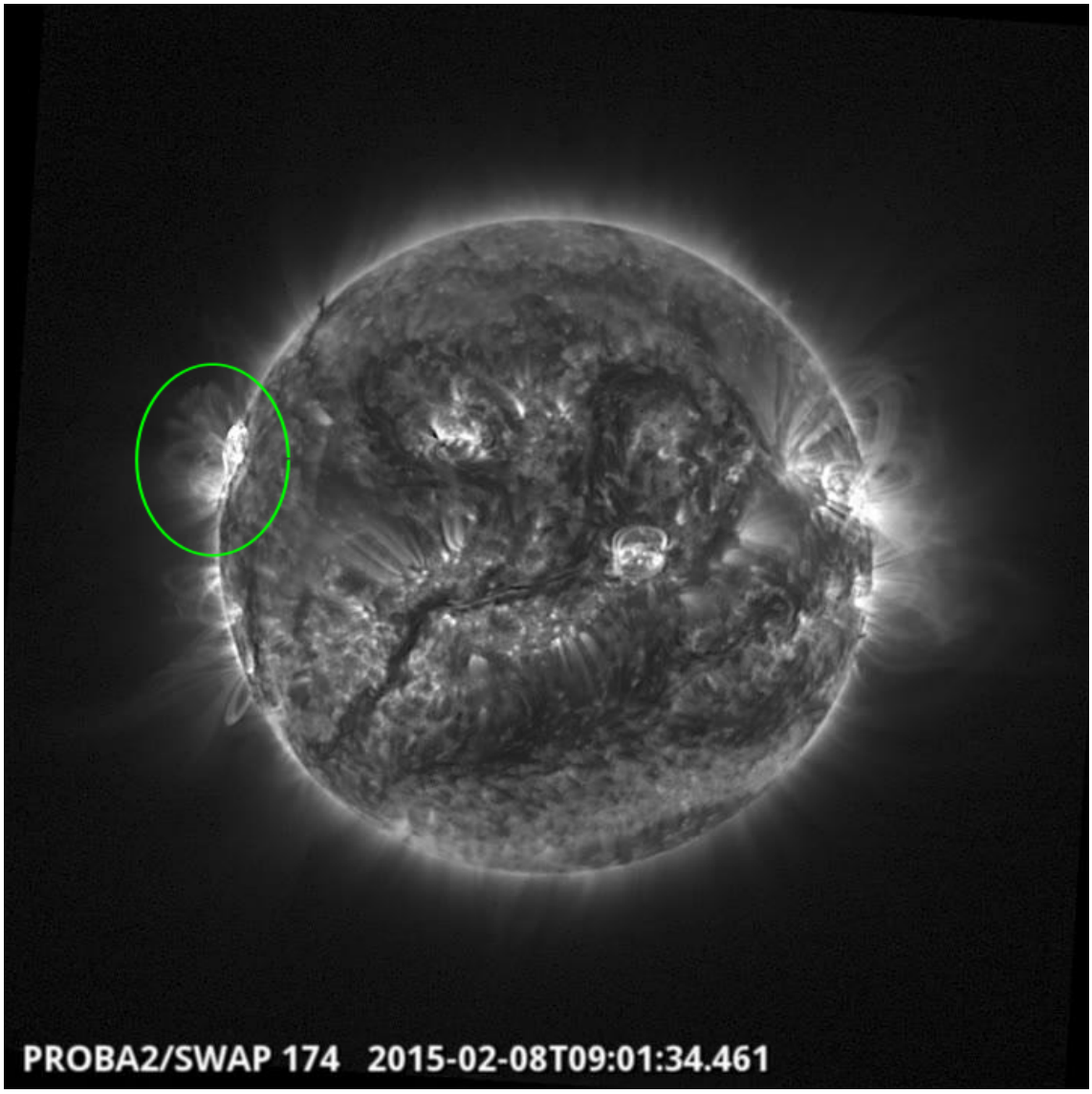


Mflare on the Suns centre @ 01:21 SWAP image
Find a movie of the event here (SWAP movie)
http://proba2.oma.be/swap/data/mpg/movies/20150204_swap_movie.mp4

Sunday Feb 08



Filament eruption on the north east limb @ 19:54 SWAP image
Find a movie of the event here (SWAP movie)
http://proba2.oma.be/swap/data/mpg/movies/20150204_swap_movie.mp4

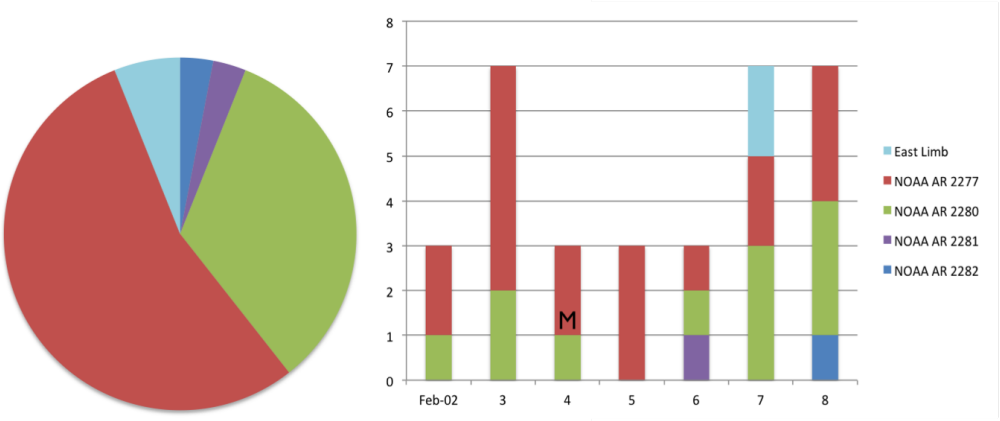


Failed eruption on the east limb @ 21:15 SWAP image
Find a movie of the event here (SWAP movie)
http://proba2.oma.be/swap/data/mpg/movies/20150208_swap_movie.mp4

4. Review of solar activity

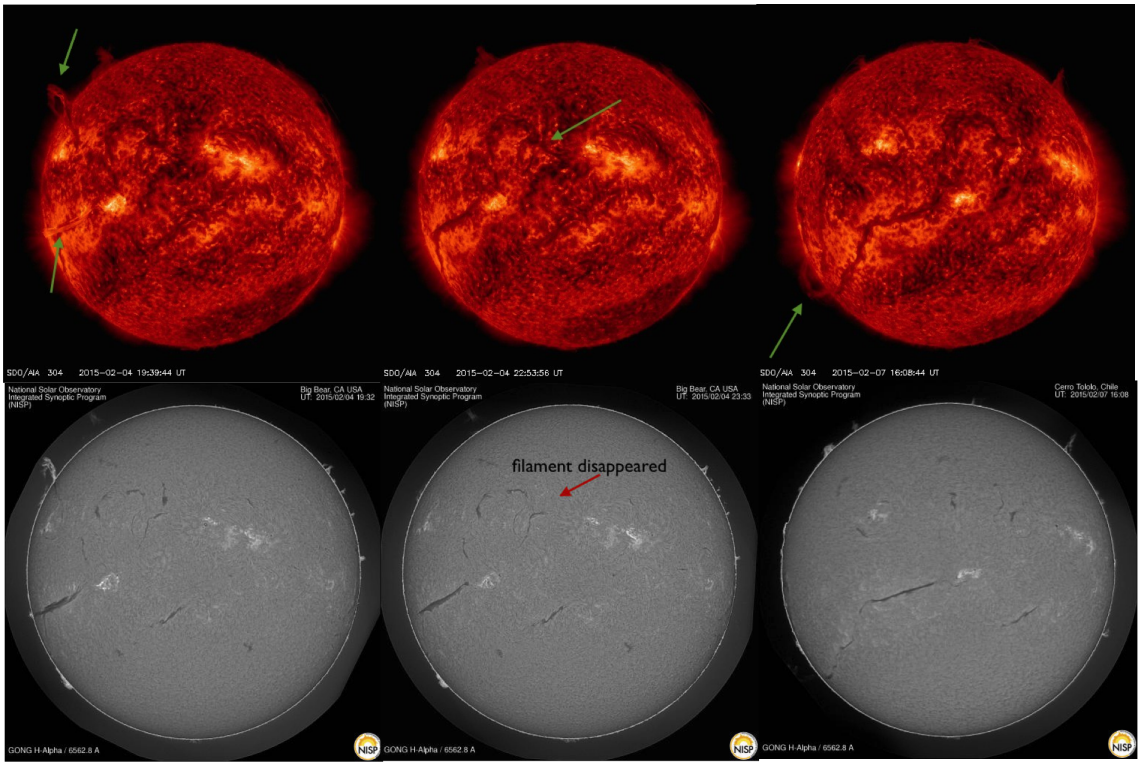
Solar activity was low over the week with just a single low class M flare: an M1.2 flare peaking at 2:15UT on February 4, originating from NOAA region 2277. This region dominated the activity over the week with multiple low class C flares. Further low class C flares were produced by the other regions on disc as well: 2268 as it rotated out of view on the west limb, 2280 moving from the eastern to the western hemisphere over the week, and 2281 and 2282 both rotating into view on the eastern hemisphere.

Distribution of C and M flares, Feb 02 – 09, 2015



The left chart gives an overview of the total number of flares per NOAA AR region for the indicated week. *East Limb* indicates that the flaring source was located at the east limb and did not have a NOAA numbering yet . The right chart gives an overview of the flaring activity per NOAA AR per day. NOAA AR 2277 flared the whole week. It was active from the moment it turned on the solar disk in the east on Jan 28 (see previous weekly bulletin).

Several filament eruptions were observed over the week. Two happened almost simultaneous in the eastern part of the solar disk on February 4 around 19:00UT, a third eruption happened near the central meridian in the northern hemisphere around 23:00UT. These events created narrow eastward CMEs. A fourth eruption started on February 7 around 15:00 UT on the east limb resulting also in an eastbound CME.
The green arrows in the pictures taken by the instrument AIA onboard of the satellite SDO point at the erupting filaments. The grey images are taken from the GONG H-alpha ground based network.



No Earth-directed CMEs were recorded.

5. Noticeable Solar Events (2 Feb 2015 - 8 Feb 2015)

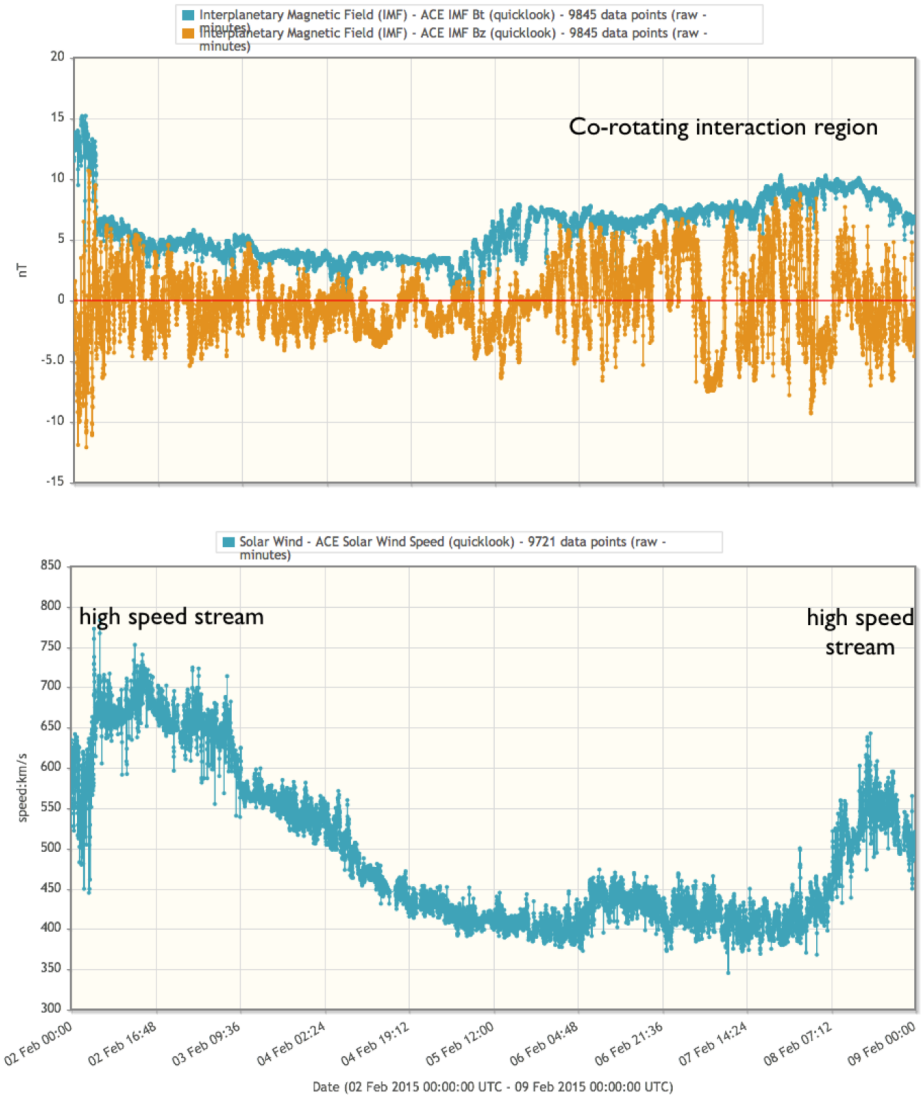
DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA
04	0208	0215	0221	N10W14	M1.2	2N		III/1	78	2277

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

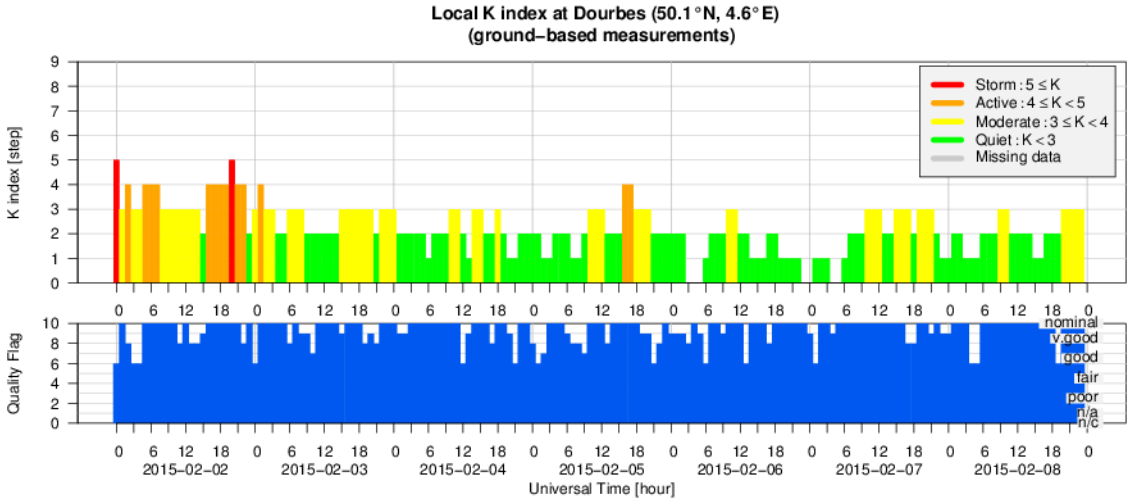
6. Review of geomagnetic activity

Solar wind was marked by the influence of a high speed solar wind (HSS) during the first days of the week reaching speeds of 750 km/s and with Bz reaching peaks of -12nT.
Geomagnetic conditions were active during this period (NOAA Kp 4) with locally even a minor geomagnetic storm (K Dourbes 4). solar wind conditions then slowly recovered. Geomagnetic conditions were otherwise quiet to unsettled apart form another period of active geomagnetic conditions, associated with a shift of the magnetic field phi angle form negative to positive on February 5.

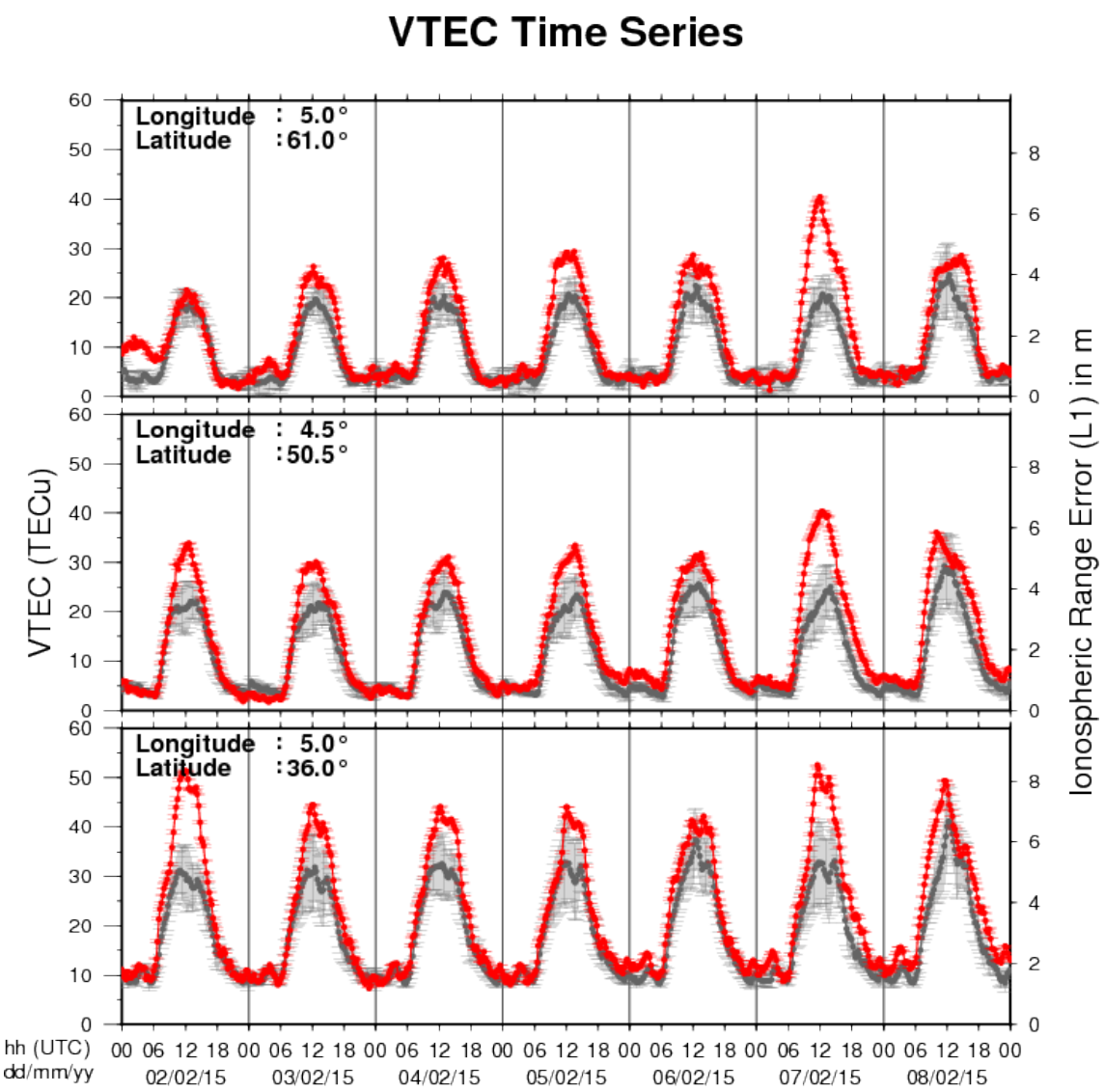
Solar wind speed increased again at the end of the week under the influence of another HSS.


Interplanetary Magnetic Field (IMF) - ACE IMF Bt (quicklook) - 9845 data points (raw - minutes)
Interplanetary Magnetic Field (IMF) - ACE IMF Bz (quicklook) - 9845 data points (raw - minutes)
Co-rotating interaction region
nT
20
15
10
5
0
-5.0
-10
-15
Solar Wind - ACE Solar Wind Speed (quicklook) - 9721 data points (raw - minutes)
high speed stream
high speed stream
speed:km/s
850
800
750
700
650
600
550
500
450
400
350
300
02 Feb 00:00
02 Feb 16:48
03 Feb 09:36
04 Feb 02:24
04 Feb 19:12
05 Feb 12:00
06 Feb 04:48
06 Feb 21:36
07 Feb 14:24
08 Feb 07:12
09 Feb 00:00
Date (02 Feb 2015 00:00:00 UTC - 09 Feb 2015 00:00:00 UTC)

7. Geomagnetic Observations at Dourbes (2 Feb 2015 - 8 Feb 2015)



8. Review of ionospheric activity (2 Feb 2015 - 8 Feb 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

9. Future Events

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

Conference on Sun-Climate Connections (SCC 2015) in Kiel, Germany

Start : 2015-03-16 - End : 2015-03-19
This international conference will provide an overview of our current understanding of Sun-Climate Connections starting at processes on the Sun itself over space weather and solar wind towards solar influence on the upper atmosphere down to the ocean. It will also provide insights into the heatedly debated role of the Sun in climate change. In four sessions the various contributions of solar variability influence on Earth's climate will be presented and discussed by bringing together solar physicists, space scientists, atmospheric scientists, climate modellers, and paleoclimatologists.
We expect contributions from scientists participating in SCOSTEP/ROSMIC, SPARC-SOLARIS/HEPPA, the EU cost network TOSCA, as well as any other interested scientists. The conference will last three full days, beginning Monday morning, 16 March 2013. The programme will consist of invited and keynote lectures, a few contributed oral presentations and ample time dedicated to poster sessions. The fourth day will be devoted to public outreach activities as well as panel discussions.
Website: http://scc.geomar.de/

URSI AT-RASC 2015 in Gran Canaria, Spain

Start : 2015-05-18 - End : 2015-05-22
URSI AT-RASC 2015 will be the first edition of the newly established triennial URSI Atlantic Radio Science Conference as one of the URSI Flagship Conferences. AT-RASC 2015 will have an open scientific program composed of submitted papers within the domains covered by all ten Commissions of URSI.
Website: http://www.at-rasc.com/

MHD waves and instabilities in the solar atmosphere in Budapest, Hungary

Start : 2015-05-25 - End : 2015-05-29
25-27 May 2015: BUKS 2015 - MHD waves: Observational aspects from ground to space - MHD waves: Theory - where are we? - MHD instabilities
27-28 May 2015: Ruderman Honorary meeting - Theory of linear MHD waves - MHD waves instabilities - Non-linear waves in plasmas
29 May 2015: Joint BUKS/Ruderman's conferences excursion - Boat excursion to Szentendre, Visegrad and Esztergom
Website:
http://swat.group.shef.ac.uk/Conferences/BUKS_2015/index.html

Los Alamos Space Weather Summer School, in Los Alamos, NM, USA

Start : 2015-06-01 - End : 2015-07-24
The Space Weather Summer School at Los Alamos National Laboratory, established in 2011 under the founding Director Josef Koller, is dedicated to space weather, space science and applications. Every year we solicit applications for the Los Alamos Space Weather Summer School. This summer school is sponsored and supported by a number or organizations at LANL. This year our top sponsors include the Los Alamos Institute of Geophysics, Planetary Physics and Signatures (IGPPS) and the Laboratory Directed Research and Development Office (LDRD). The summer school brings together top space science students with internationally recognized researchers at LANL in an educational and collaborative atmosphere.
Website:

http://www.swx-school.lanl.gov/

Solar dynamo frontier workshop in Boulder, CO (USA)

Start : 2015-06-09 - End : 2015-06-12
The last five years have seen substantial progress in our understanding of the solar dynamo, fueled by continuing advances in observations and modeling. With the launch of NASA's Solar Dynamics Observatory (SDO) in 2010 came an unprecedented window on the evolving magnetic topology of the Sun, highlighting its intricate 3D structure and global connectivity. The Helioseismic Magnetic Imager (HMI) instrument on SDO in particular has provided potentially transformative yet enigmatic insights into the internal dynamics of the solar convection zone that underlie the dynamo. Attempts to detect subsurface convective motions from helioseismic inversions have yielded only upper limits on the large-scale convective amplitude, challenging our understanding of global solar convection. Yet, potential signatures of giant cells have been detected in photospheric Dopplergrams. Estimates of the meridional flow from HMI and complementary instruments (SOHO/MDI and GONG) have been equally tantalizing and enigmatic. Several disparate techniques, including local and global helioseismic inversions and correlation tracking of surface features, have yielded evidence of a multi-cellular meridional flow but they differ on the detailed flow structure and amplitude. This multi-cellular meridional flow has potentially profound implications for flux-transport dynamo models that previously assumed a very different structure with a single circulation cell per hemisphere.
Website:
https://www2.hao.ucar.edu/Workshop/Solar-Dynamo-Frontiers

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

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/

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/