STCE Newsletter

13 Oct 2014 - 19 Oct 2014

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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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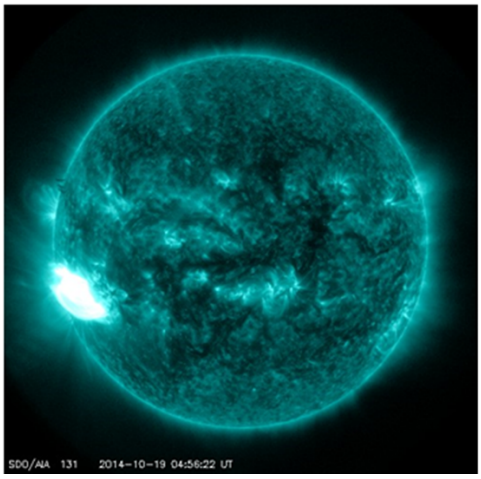
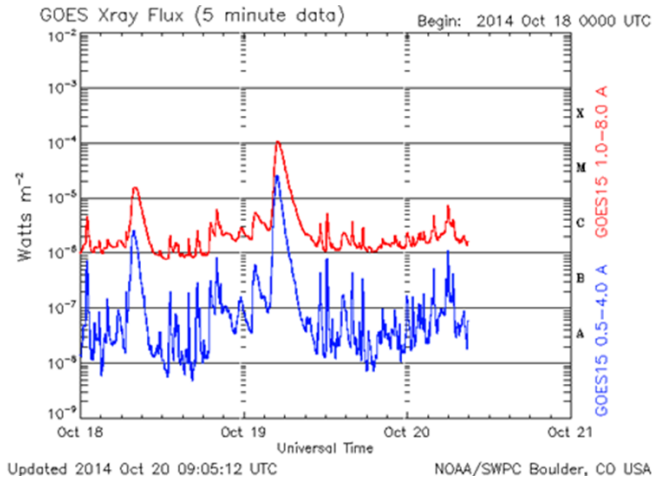
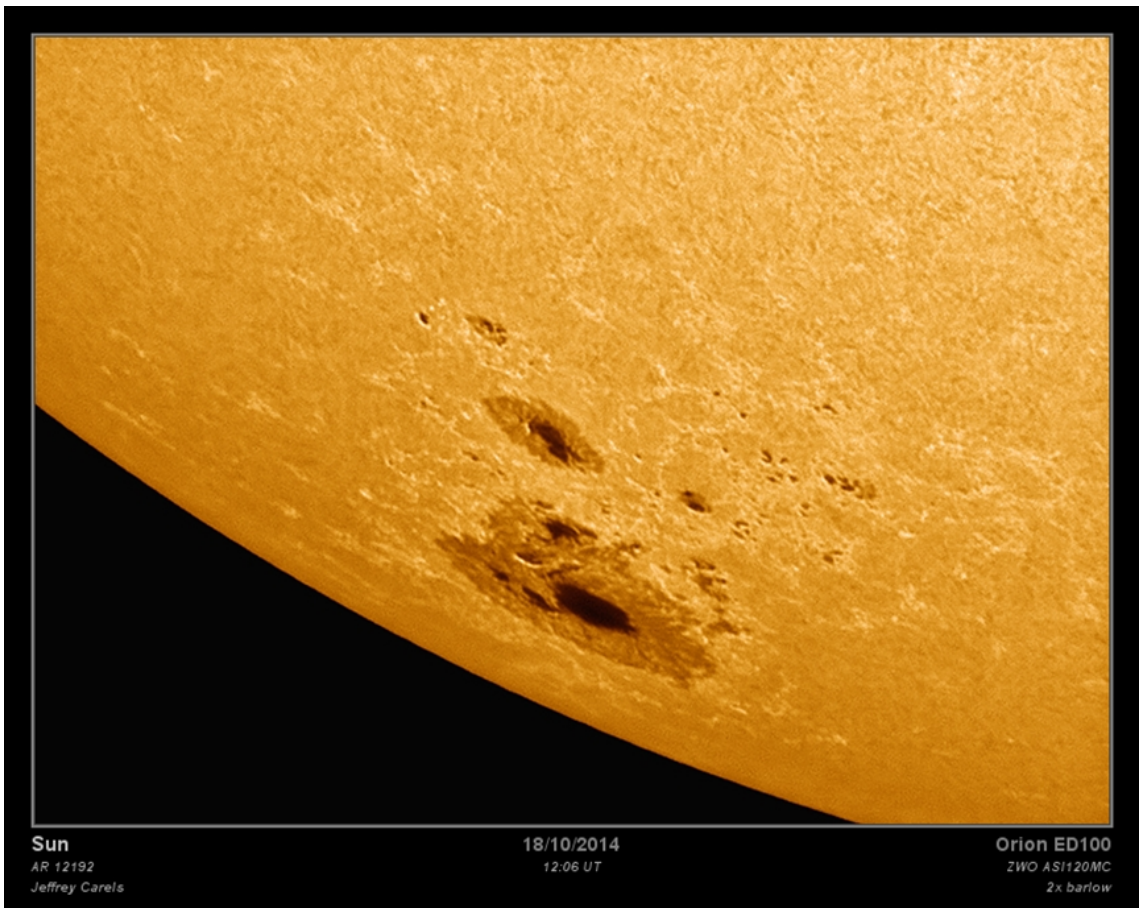
1. NOAA "Boom! Boom!" 2192

On 19 October, an X1.1 flare was observed. Starting at 04:17UT, this long duration event (LDE) ended only at 05:48UT. Remarkably, the peak x-ray flux stayed at the X1.1-level for a full 6 minutes, i.e. from 05:01UT till 05:06UT. This flare was the 36th solar flare of ongoing solar cycle 24, but due to its low-level strength, it is ranked at the bottom of the X-class event list (see the Top-10 at http://www.stce.be/news/268/welcome.html).

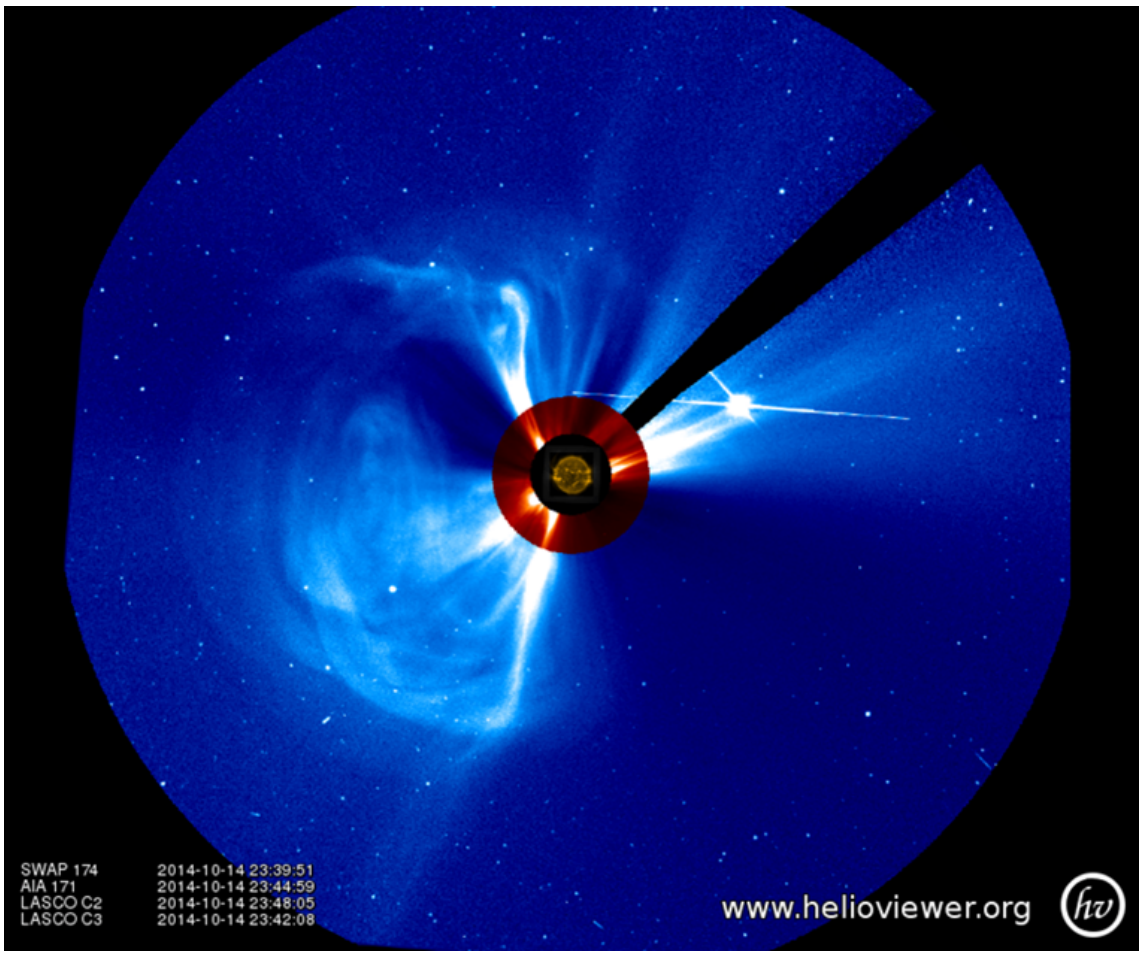




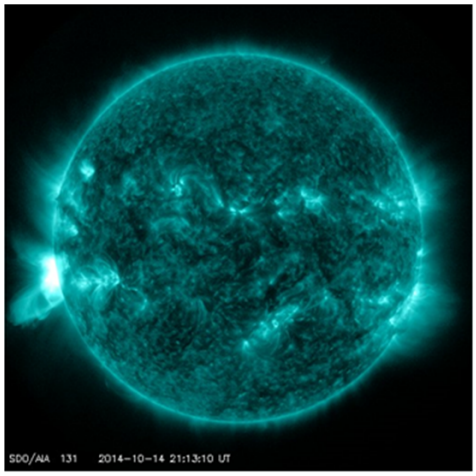
The source of this "eXtreme" eruption was NOAA 2192, a big and complex sunspot region still close to the southeast border. Its position on the solar disk is very similar to the sunspot complex NOAA 2172/2173, which rounded the west limb just 2 weeks ago with a bang (see http://www.stce.be/news/272/welcome.html for the M7-flare on 2 October). NOAA 2192 is by far the largest group so far this solar cycle, with a surface area about 15 times that of the Earth! Using safe solar eclipse glasses, several observers from the Belgian Solar Section (http://www.vvs.be/werkgroepen/werkgroep-zon) reported it already as a naked eye object on Sunday morning, 19 October. The image underneath is a photo of the colossus taken by Jeffrey Carels just a day earlier.

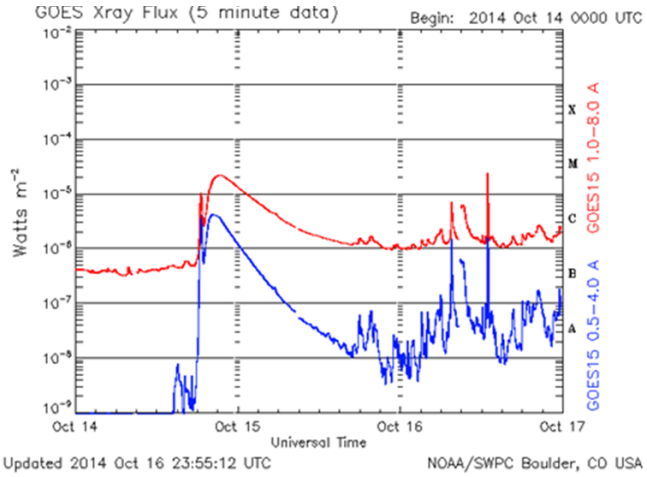


Most interestingly, no coronal mass ejection (CME) seems to have been associated to this X-class flare, differing quite significantly from another flaring event from the same active region just a few days earlier. Indeed, on 14 October, an M2.2-flare peaked at 21:21UT and was associated to an impressive (backsided) asymmetric halo CME. This solid CME was extremely bright (image underneath), as a large area of the LASCO C2 coronagraph onboard the SOHO spacecraft even got saturated! Interestingly, imagery from SDO's AIA 304 (imaging at cooler temperatures of about 80.000 degrees) did not show any large prominence eruption that could have accounted for most of the bright material seen by LASCO. Another curious thing is that the CME was not very fast (only about 920 km/s), probably due to its very high mass (very bright!).

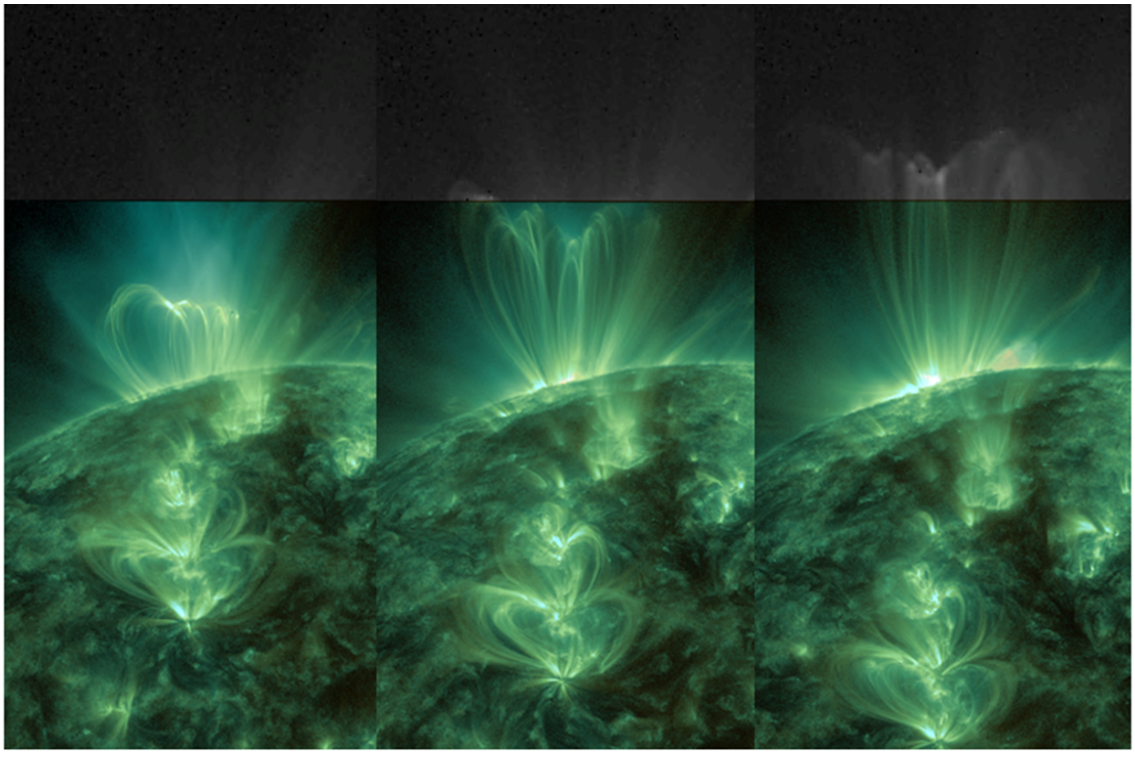


This M2-flare was also an LDE, starting at 19:07UT and ending only at 00:19UT the next day. It was preceded by an M1.1 flare of normal duration, peaking at 18:37UT. Scientists suspect the entire event was probably a single flare, out of which we could see only the beginning and the end. Indeed, NOAA 2192 was still about 2 (two!) days behind the east limb, and part of the rising phase was most probably occulted by the solar limb. Moreover, because of this occultation, the true strength of the flare was probably somewhat higher, and may perhaps have been an X-class event. The x-ray flux never fell back to its pre-M-flare level (B4), instead leveling off nearly a full day later (!) at the C1-level. In AIA images, there was a large, long staying volume of hot material above the post-flare loops that -scientists suspect- may probably explain that duration.



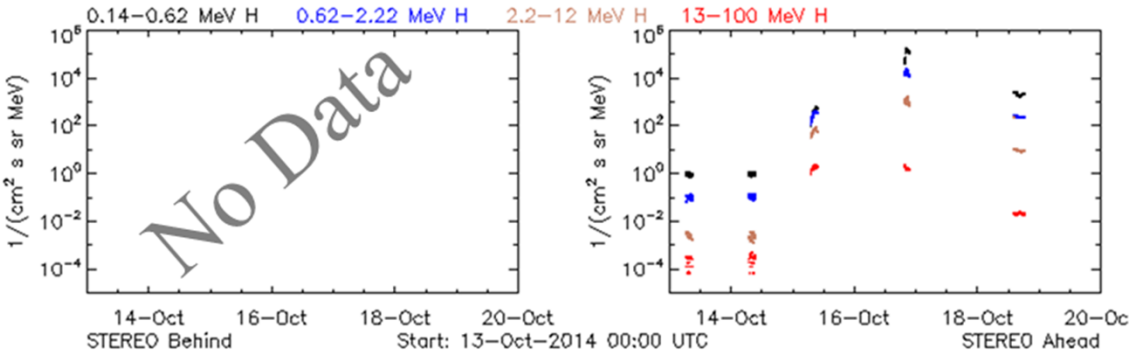


The M2-event finished with an arcade, which is the technical term for a series of post-flare coronal loops. Interestingly, these post-flare loops continued to grow, first reaching the limit of AIA's Field-Of-View (FOV) on 15 October around 17:00UT, then continuing to grow even beyond AIA's FOV. Fortunately, PROBA2's wider-field SWAP telescope came to the rescue and was able to monitor this arcade in its full glory till its disappearance around noon on 17 October. So, the loops of this long duration arcade were visible for about 2.5 days (60 hours!), and at their maximum height, they were towering at least 340.000 km above the solar surface. That's not far from the average Earth-Moon distance!



15 October 2014 – 06:00UT **15 October 2014 – 18:00UT** **16 October 2014 – 06:00UT**

Despite the few data, STEREO-A recorded also energetic protons related to this flaring event. This was no surprise, as the flare was just beyond the east limb (seen from Earth) and both STEREO spacecraft were magnetically connected to this region. Given the short time between the flare and the event in STEREO A, it is currently assumed that the energetic particles are coming from the eruption site, and not from a later acceleration by the CME shock.



Movies of the 2 flaring events can be found at http://youtu.be/q4RKIXlTTnc

Credits - Imagery and data taken from SDO (http://sdo.gsfc.nasa.gov/), SOHO (http://sohowww.nascom.nasa.gov/home.html), PROBA2 http://proba2.oma.be/ssa), and STEREO (http://stereo.gsfc.nasa.gov/).

2. STEREO-B in trouble

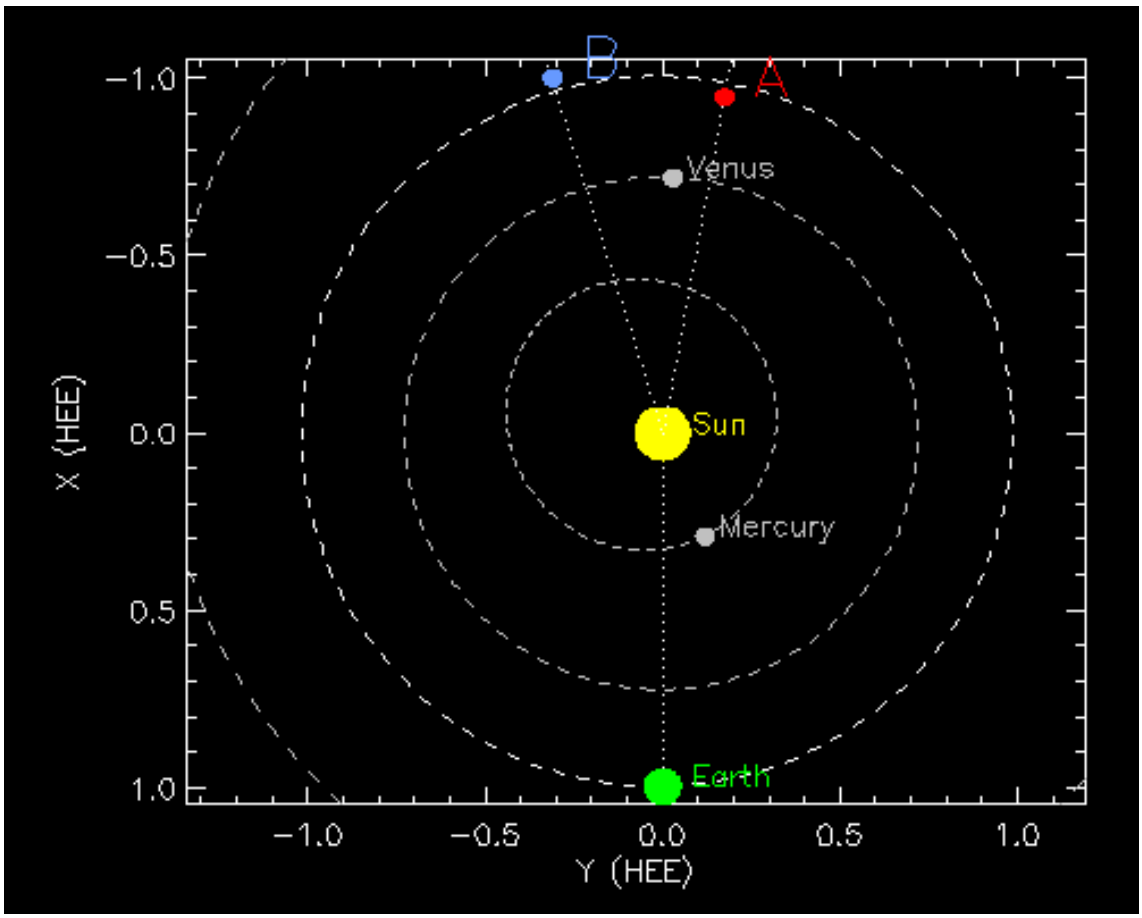
Disturbing news from the STEREO Science Center:

"Communications with the STEREO Behind spacecraft were interrupted on October 1, immediately after a planned reset of the spacecraft performed as part of a test of solar conjunction operations. The cause of the anomaly is not yet known, though a sensor anomaly in the guidance and control system is suspected. Attempts to recover the spacecraft are continuing."

This does not concern the anticipated degradation in communications as both STEREO spacecraft pass behind the Sun in 2014-2015, as discussed earlier in this news item at http://stce.be/news/253/welcome.html.
There really seems to be a technical problem with the spacecraft. The engineering team has met every day, and the original spacecraft designers have been consulted. With the aid of the Deep Space Network radio telescopes, the STEREO team is trying to re-establish contact with STEREO-B, but so far with no success. The communication efforts are obviously hampered by the Sun's proximity (line-of-sight).

"The question whether the current orbit of the STEREO-B spacecraft will carry it to a location where the signal strength will be stronger is difficult to answer, because the true attitude of the spacecraft is not known. However, assuming nominal Sun pointing, the signal strength will not improve until significantly past solar conjunction."

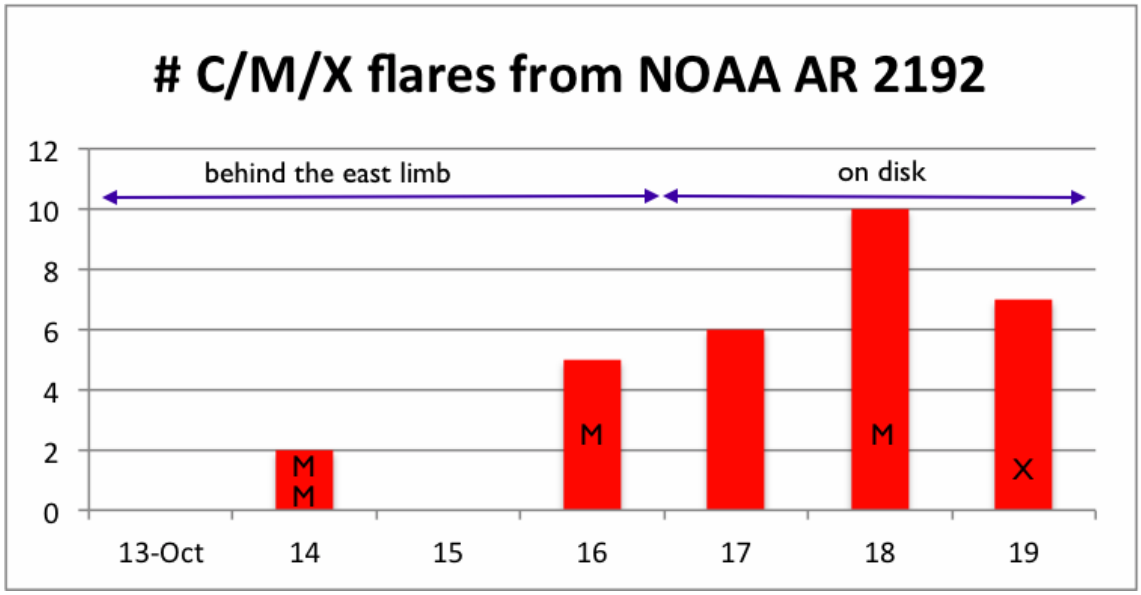
Gloomy perspectives, but hopefully the STEREO-team still manages to do the impossible! Fingers crossed!



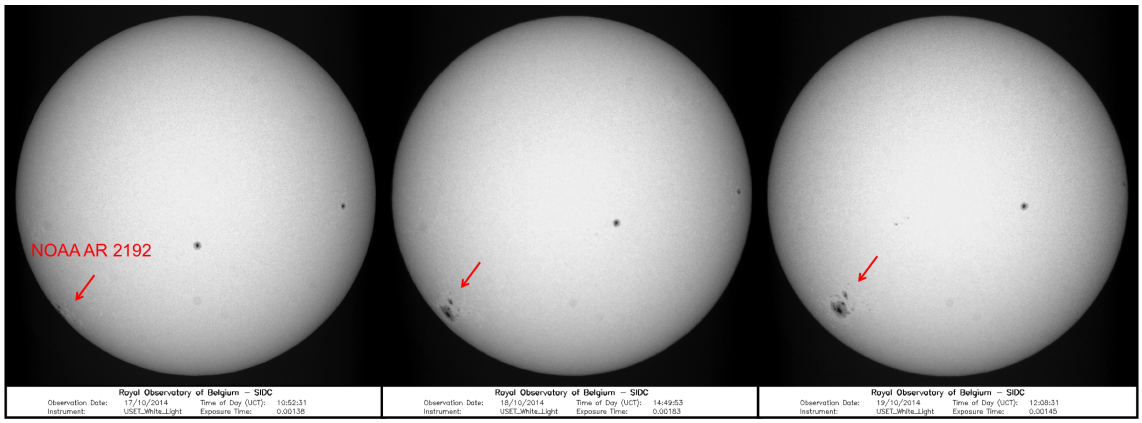
3. Review of solar and geomagnetic activity

Solar Activity

The week started without any C flares. On October 14, two M-flares from a region behind the east limb were registered. It was the active region that got the label NOAA 2192 once it rotated on the solar disk early October 17. The pictures below are taken with the USET (http://sidc.be/uset/) white-light CCD camera on three consequent days.



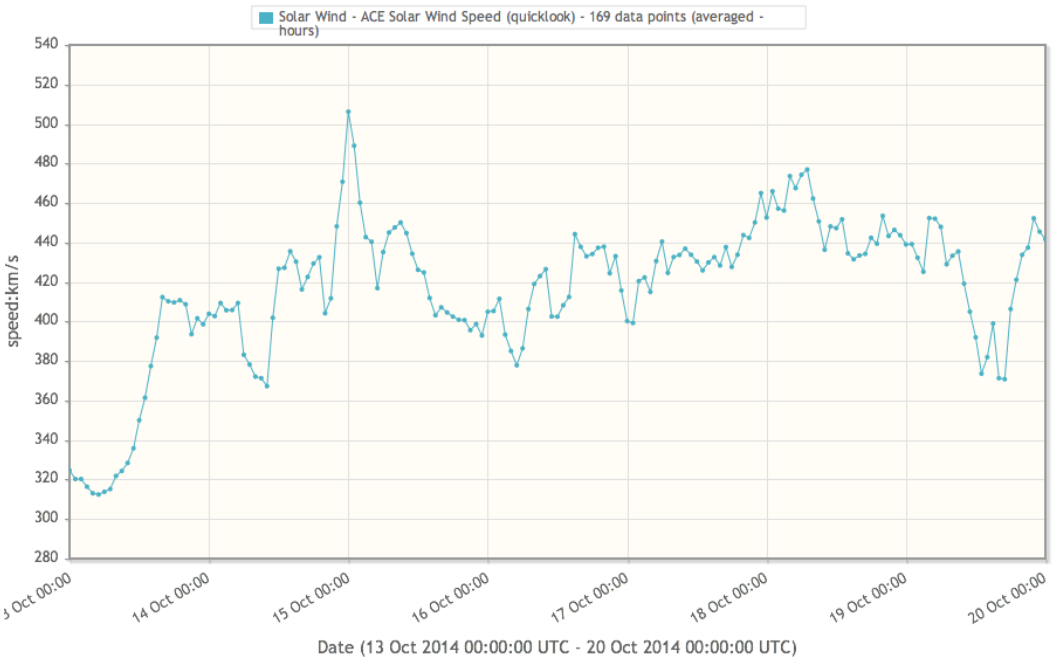
This beta-gamma region was the only region that produced flares above the B level. In total, 1 X flare, 4 M flares and 25 C flares were observed, all produced by AR 2192. So, it makes a rather simple flare-chart:



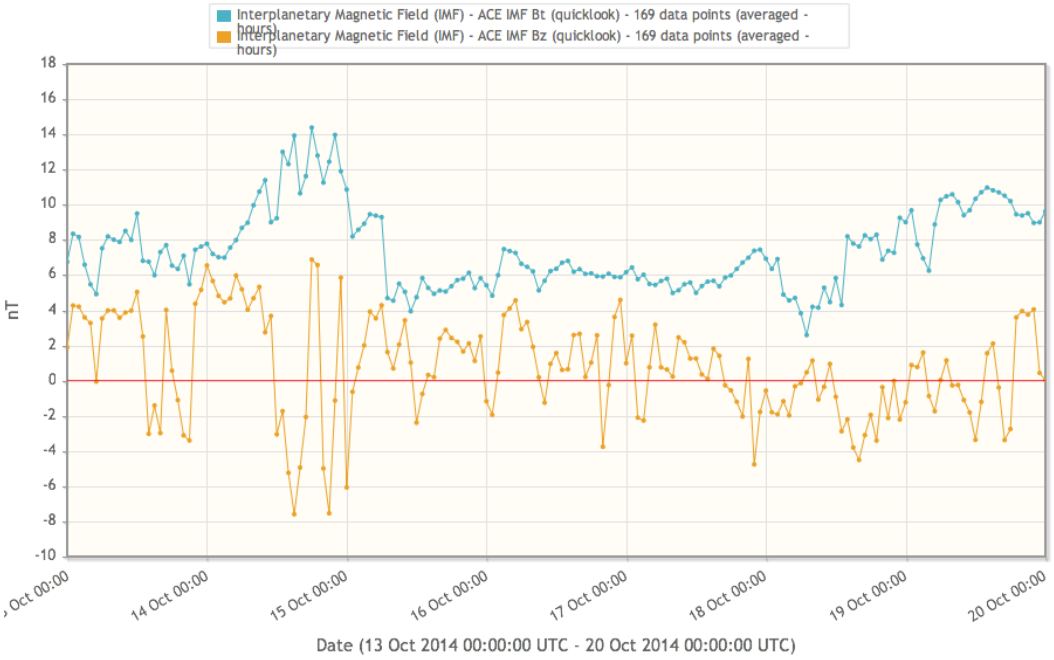
The M1.1 flare which peaked at 18:37 UT on October 14 was associated with a full halo (backside) CME first detected by LASCO C2 at 19:00 UT on October 14. Its main bulk propagated towards the southeast at an estimated speed of 923 km/s as measured on LASCO C2 and C3 imagery. Since it was backside, the CME was not geo-effective.

Geomagnetic Activity

Solar wind speed as observed by ACE was variable and fluctuated between 300 and 520 km/s (hourly averaged).



The magnitude of the Interplanetary Magnetic Field (IMF) varied between 0.5 and 16 nT.



This variable behavior of the solar wind may be linked with the arrival of unidentified ICMEs. NOAA Kp indicated a minor geomagnetic storm between 18h UT on October 14 and 3h UT on October 15. On October 14, K Dourbes was above 3 from 17h till 21h UT and went to minor storm values between 20h and 21h UT. This was the result of the increased solar wind speed combined with Bz values below -10

nT or thereabouts. For the rest of the week, geomagnetic activity was quiet (K Dourbes and NOAA Kp smaller than 4), with some active (K Dourbes equal 4) excursions on October 17 to 19.

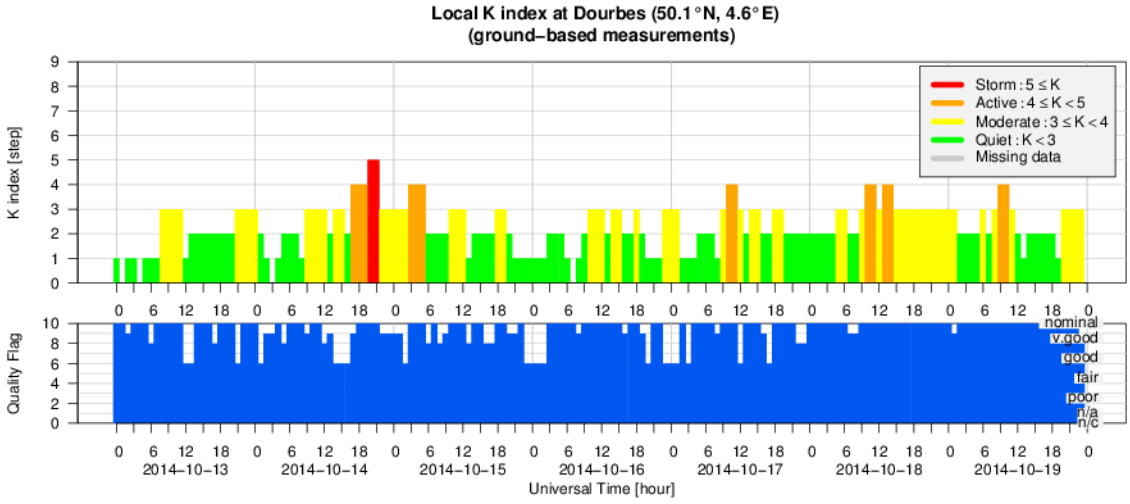
4. Noticeable Solar Events (13 Oct 2014 - 19 Oct 2014)

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA
14	1821	1837	1846		M1.1		1300			
14	1907	2121	0019		M2.2		1800	VI/1III/2CTM/1		
16	1258	1303	1305		M4.3		190	III/2		2192
18	0702	0758	0849	S13E71	M1.6	SF		III/1		2192
19	0417	0503	0548		X1.1			CTM/1		2192

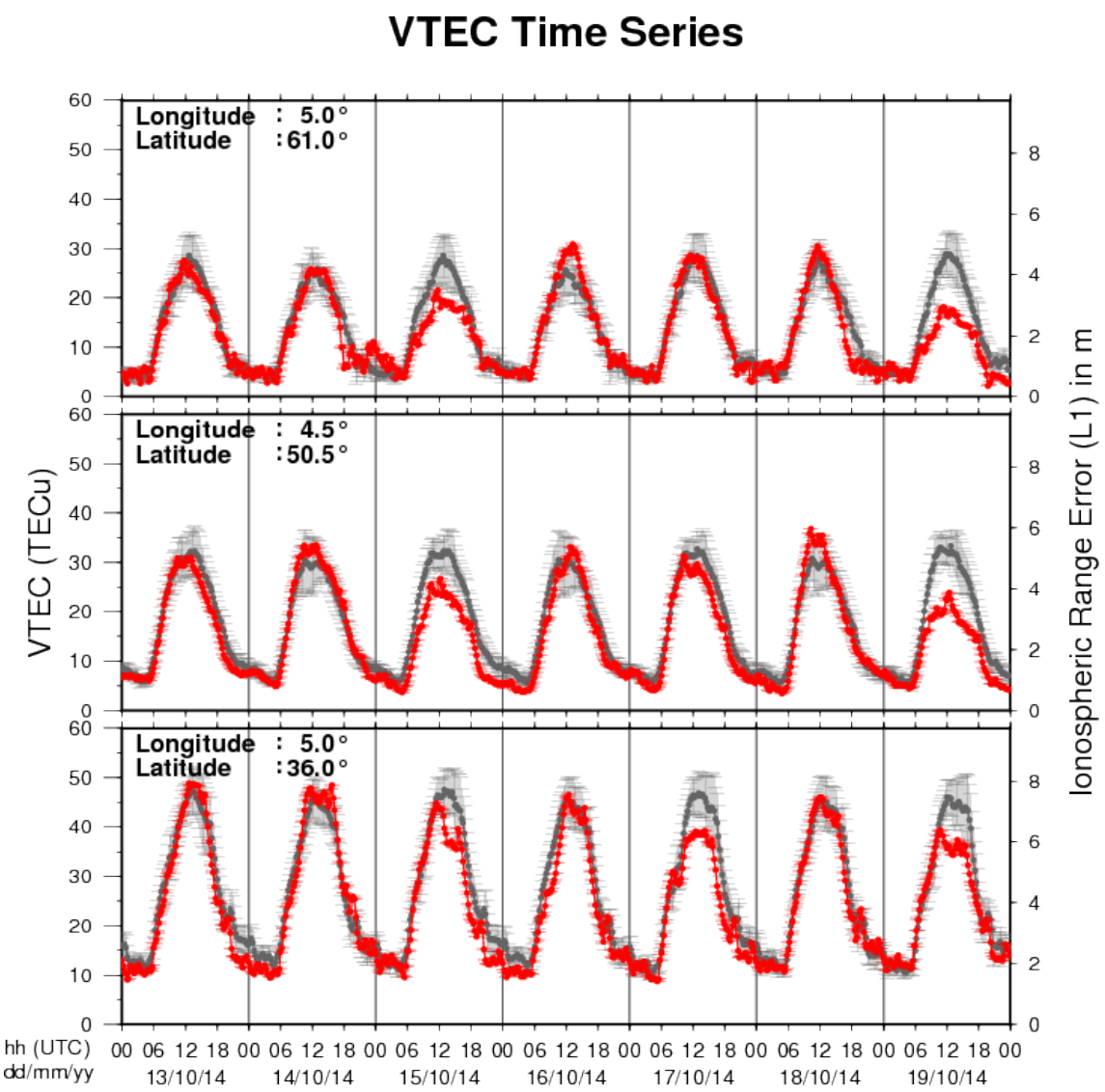
LOC: approximate heliographic location
XRAY: X-ray flare class
OP: optical flare class
10CM: peak 10 cm radio flux

TYPE: radio burst type
Cat: Catania sunspot group number
NOAA: NOAA active region number

5. Geomagnetic Observations at Dourbes (13 Oct 2014 - 19 Oct 2014)



6. Review of ionospheric activity (13 Oct 2014 - 19 Oct 2014)



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

2014 Conference on Big Data from Space (BiDS '14) in Frascati, Italie

Start : 2014-11-12
This conference aims to bring together researchers, engineers, users in the area of Big Data in the Space sector.
The focus is on the whole data lifecycle, ranging from data acquisition by spaceborne and ground-based sensors to data management, analysis and exploitation in the domains of Earth Observation, Space Science, Space Engineering, Space Weather, etc.
Special emphasis will be put on highlighting synergies and cross-fertilization opportunities from domains like Climate Change, Solid Earth Science, Planetary Sciences, Life Science, Astrophysics, High Energy Physics, Social Sciences, etc.
We expect this conference to:
* contribute towards a common "Big Data from Space" scientific and programmatic framework
* widen competences and expertise of universities, labs and industrial actors
* foster networking of experts and users towards better access and sharing of data, tools and resources
* leverage innovation, spin-in, spin off of technologies, and business development arising from research and industry progress
Website:
http://congrexprojects.com/2014-events/BigDatafromSpace/objectives

European Space Weather Week in LiÃ¨ge, Belgium

Start : 2014-11-17 - End : 2014-11-21
The 11th Edition of the European Space Weather Week will take place on 17-21nd November 2014 in Liège, Belgium.
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 is coordinated by the Belgian Solar-Terrestrial Centre of Excellence (STCE), ESA and the Space Weather Working Team. The local organisation is done by the STCE.
Website:
http://www.stce.be/esww11/

2014 AGU Fall Meeting in San Fransisco, USA

Start : 2014-12-15 - End : 2014-12-19
The AGU Fall Meeting is the largest worldwide conference in the geophysical sciences, attracting more than 22,000 Earth and space scientists, educators, students, and other leaders. For 46 years, energized and passionate Earth and space scientists from around the world gather at the AGU Fall Meeting to connect with colleagues, broaden their knowledge base, and embrace the joy of science. The 2014 meeting takes place Monday 15 - Friday 19 December 2014.
Several sessions about space weather are foreseen:
*
When and Why Does Space weather Forecasting Fail?
*
Addressing Operational Space Weather Needs
*
Near Real Time Data for Earth Science and Space Weather Applications

*
Understanding Hemispheric Asymmetry and Space Weather
*
Connection of Solar Events With the Variability of Space Environments
*
Bz from the Sun to the Earth: Observations and Modeling
*
Solar Sources and Heliospheric Consequences of Coronal Mass Ejections in Solar Cycle 24
*
Advances in Ionospheric Forecasting - Modeling, Observations, and Validation
Abstract Submission Deadline: August 6, 2014
Website:
http://fallmeeting.agu.org/2014/

Measurement Techniques for Solar and Space Physics, in Boulder, CO, USA

Start : 2015-04-20 - End : 2015-04-24
This gathering was born out of the desire to collect in one place the latest technologies required for advancement of science in the discipline of Solar and Space Physics. In doing so, it was recognized that the two 1998 volumes of 'Measurement Techniques in Space Plasmas' (Particles and Fields) have been a valuable reference and resource for advanced students and scientists who wish to know the fundamentals of measurement techniques and technology.
Website:
https://mtssp.msfc.nasa.gov/

26th General Assembly of the International Union of Geodesy and Geophysics (IUGG) in Prague, Czech Republic

Start : 2015-06-22 - End : 2015-07-02
We invite contributions on novel inversion methods with application across the geosciences. Of particular interest are 3D imaging, joint inversion of geodetic, geophysical and geochemical datasets, and multi-disciplinary interpretation approaches such as integration of gravity, EM and seismic data or thermo-mechanical modelling studies constrained by physical parameters.
Modelling of Space Weather Effects: Solar, Magnetospheric and Earth Resistivity Constraints (IAGA, IAMAS)
In this symposium we welcome contributions on all aspects of the modelling of space weather and its effects, from the Sun to Earth. This includes the modelling of the various interactions between travelling solar storms and the solar wind, magnetosphere, ionosphere and solid Earth and the validation of models through measurements. Contributions on models developed to aid end-users, such as satellite and power grid operators, survive the impact of space weather are also encouraged.
Website:
http://www.iugg2015prague.com/joint-inter-association-symposia.htm#JA

8. New documents in the European Space Weather Portal Repository

See http://www.spaceweather.eu/en/repository

STCE - Pourquoi mesurer la pesanteur g?

Presentation, in French given at the open doors of the Space Pole, Brussels, Belgium, 2014
http://www.spaceweather.eu/en/repository/show?id=542

STCE - Waarom meten we de valversnelling g?

Presentation, in Dutch given at the open doors of the Space Pole, Brussels, Belgium, 2013.

http://www.spaceweather.eu/en/repository/show?id=543

STCE - Pourquoi Vénus est-elle si différente de la Terre?

Presentation, in French given at the open doors of the Space Pole, Brussels, Belgium, 2014
http://www.spaceweather.eu/en/repository/show?id=544

STCE - Pourquoi installer des stations GNSS en Antarctique?

Presentation, in French given at the open doors of the Space Pole, Brussels, Belgium, 2014
http://www.spaceweather.eu/en/repository/show?id=545

STCE - L'exploration de la planète Mercure

Presentation, in French given at the open doors of the Space Pole, Brussels, Belgium, 2014
http://www.spaceweather.eu/en/repository/show?id=546

STCE - De zon bestuderen met PROBA2, hoe ontwerp en lanceer je een satelliet?

Presentation, in Dutch given at the open doors of the Space Pole, Brussels, Belgium, 2014
http://www.spaceweather.eu/en/repository/show?id=547

STCE - Les grands tremblements de terre de nos régions et leurs conséquences sur le bâti

Presentation, in French given at the open doors of the Space Pole, Brussels, Belgium, 2014
http://www.spaceweather.eu/en/repository/show?id=549

STCE - Seismologie in België

Presentation, in Dutch given at the open doors of the Space Pole, Brussels, Belgium, 2014
http://www.spaceweather.eu/en/repository/show?id=548

STCE - Ruimteweer: de impact van zonnestormen op aarde

Presentation, in Dutch given at the open doors of the Space Pole, Brussels, Belgium, 2014
http://www.spaceweather.eu/en/repository/show?id=550

STCE - Seismologie in België

Presentation, in Dutch, given at the open doors of the Space Pole, Belgium, 2014
http://www.spaceweather.eu/en/repository/show?id=551

STCE - Les éruptions solaires: quand notre astre se fâche

Presentation, in Dutch, given at the open doors of the Space Pole, Belgium, 2014
http://www.spaceweather.eu/en/repository/show?id=552