

STCE Newsletter

21 Apr 2014 - 27 Apr 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.

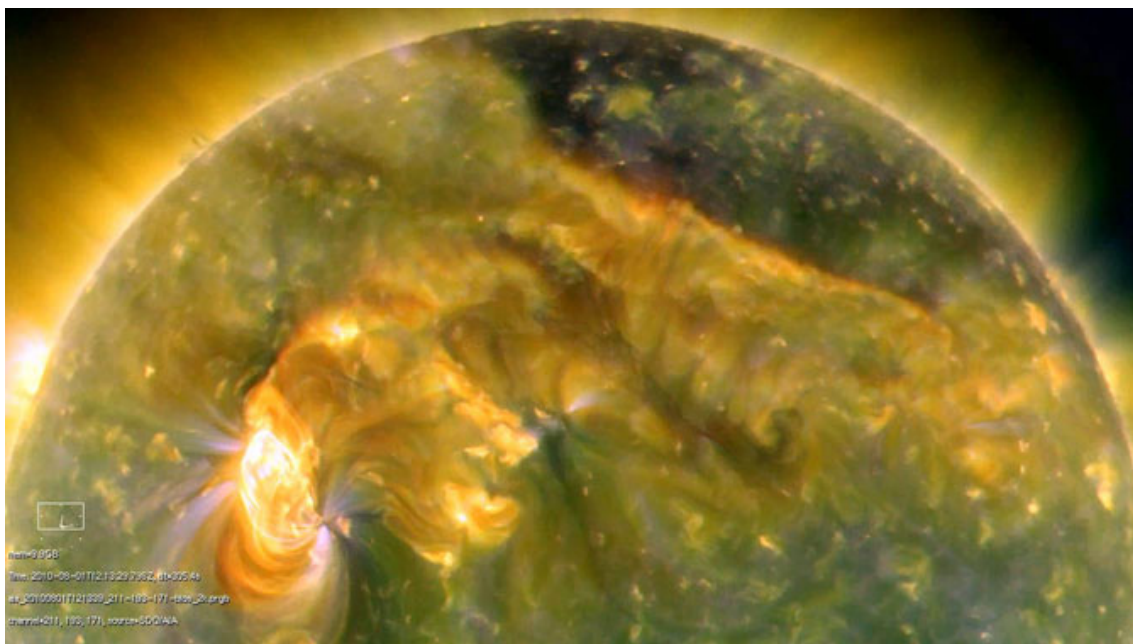
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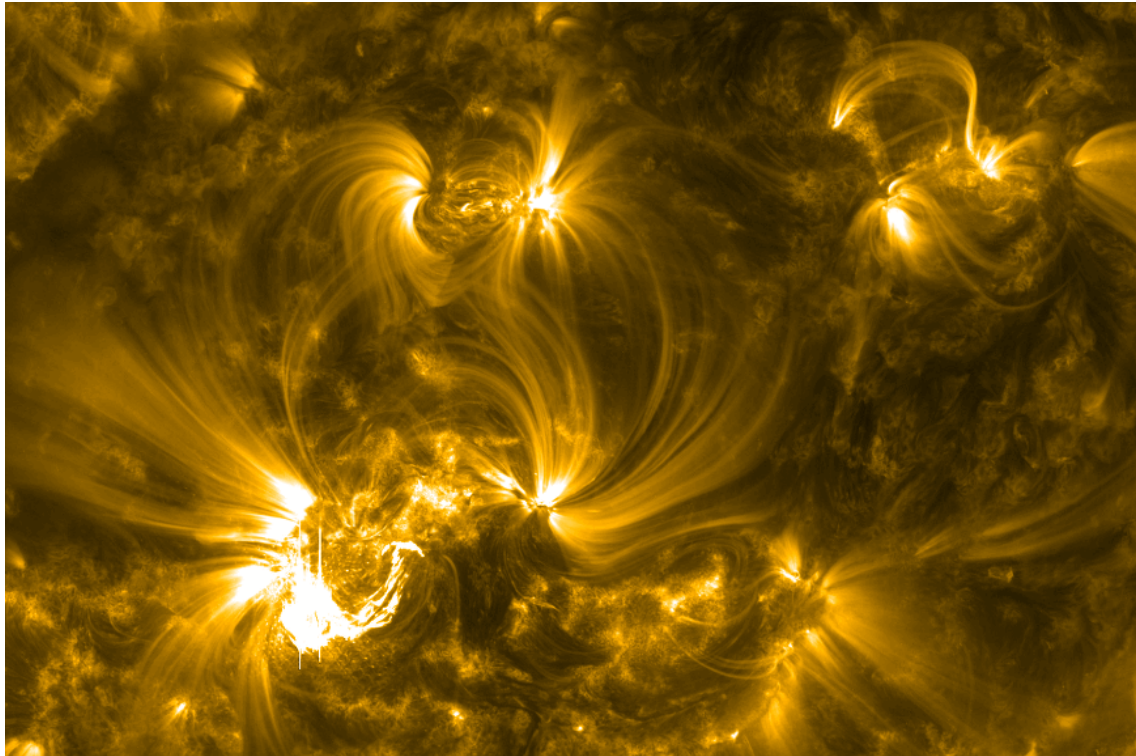
1. Sympathetic flares

Simultaneous flares are unrelated solar flares in different active regions that occur at nearly the same time. If the flares coincide in time not by chance, but by the triggering of some physical connection, they are called sympathetic flares. More loosely, a sympathetic flare can also be defined as the initiation of a solar flare resulting from a transient phenomenon occurring elsewhere on the Sun. Hence, sympathetic flares are a subset of simultaneous flares.

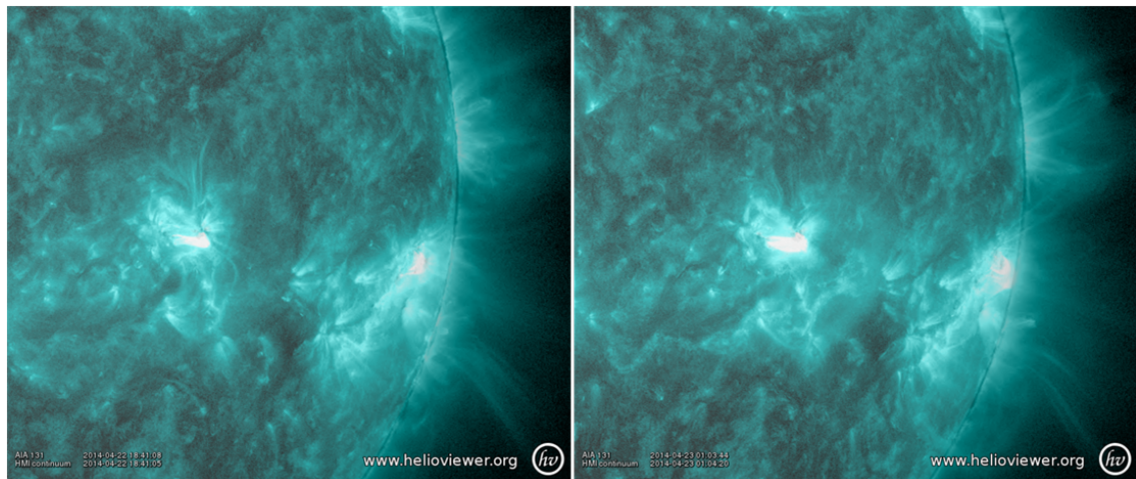
The distinction between the two, i.e. is the pair of flares somehow physically connected or not, is a difficult problem. Though the existence of sympathetic flares was suggested already in the mid 1930's, their existence is still being debated. Important support for the existence of a physical connection between two far-away regions was given on 1 August 2010, when pretty much the entire visible northern hemisphere erupted. In a matter of hours, various flares and filament eruptions occurred though they were several 100.000 km separated from each other (Note 1).



There may be several causes for sympathetic flares. In EUV (SDO/AIA at <http://sdo.gsfc.nasa.gov/>), coronal loops can sometimes be seen connecting active regions, occasionally even crossing the solar equator. Any disturbance in one region can then quickly be "transported" to the other region, where it may induce another flare or filament eruption (image underneath). Also EIT waves (see this news item at <http://www.stce.be/news/241/welcome.html>) may disturb the magnetic conditions of a distant region or filament enough to trigger an eruption. It is generally believed that further examination of these sympathetic events may lead to a better understanding of flaring mechanisms.



Last week, scientists got a few additional simultaneous flares requiring further investigation. No less than 8 flare events had coinciding brightenings in two or even three well separated sunspot regions. Half of these occurred between NOAA 2035 and 2038. This movie at <http://youtu.be/tCOMBEGSo7c> shows two examples on 22 and 23 April. It concerns a C2 and C4 flare peaking resp. at 18:41UT and 01:04UT (images underneath). In both cases, the brightening peaked almost at the same moment in the sunspot groups. Note also the small flare south of NOAA 2042 around 23:50UT, which may or may not have initiated the 01:04UT events hardly an hour later. Further research is required to determine if there was a true physical connection or not.



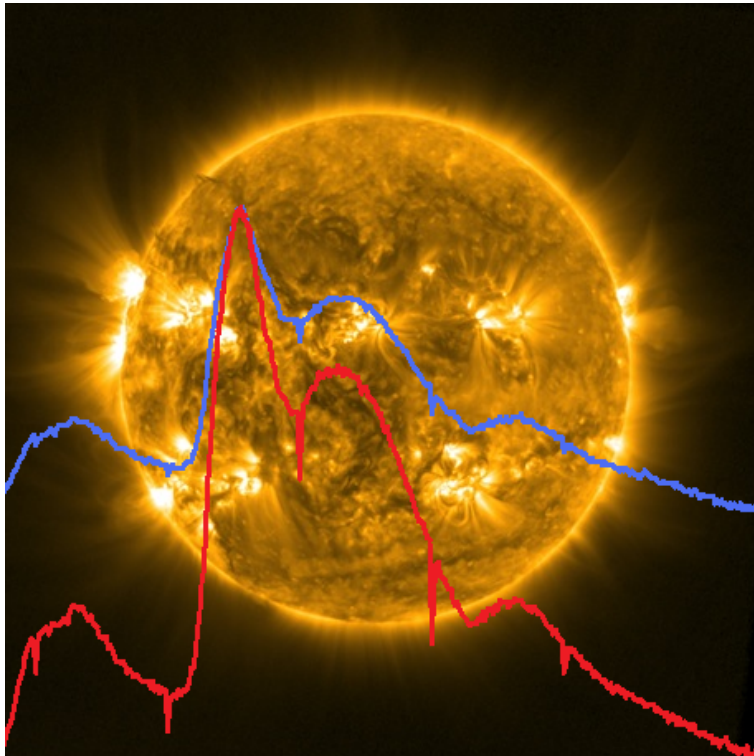
Note 1:

Further reading and movies on this event in this STCE News item (<http://www.stce.be/news/x129x/welcome.html>) and in NASA's Science News (http://science.nasa.gov/science-news/science-at-nasa/2010/13dec_globaleruption/).

2. PROBA2 Guest Investigator Call

If your dream is to work with satellites, than the team that coordinates the science based on data taken by the scientific instruments SWAP and LYRA onboard of the micro-satellite PROBA2 might be looking for you: to discover the science still hidden in the EUV pictures of the sun and its surrounding corona made with the instrument SWAP or in the intensity curves of the EUV sunlight that LYRA draws. The PROBA2 guest investigator program offers a few weeks in the PROBA2 science nerve center where you can participate in the daily commanding of SWAP and LYRA, discuss with other experts and gain valuable know-how on solar instrumentation. Maybe this might lead to a science break through.

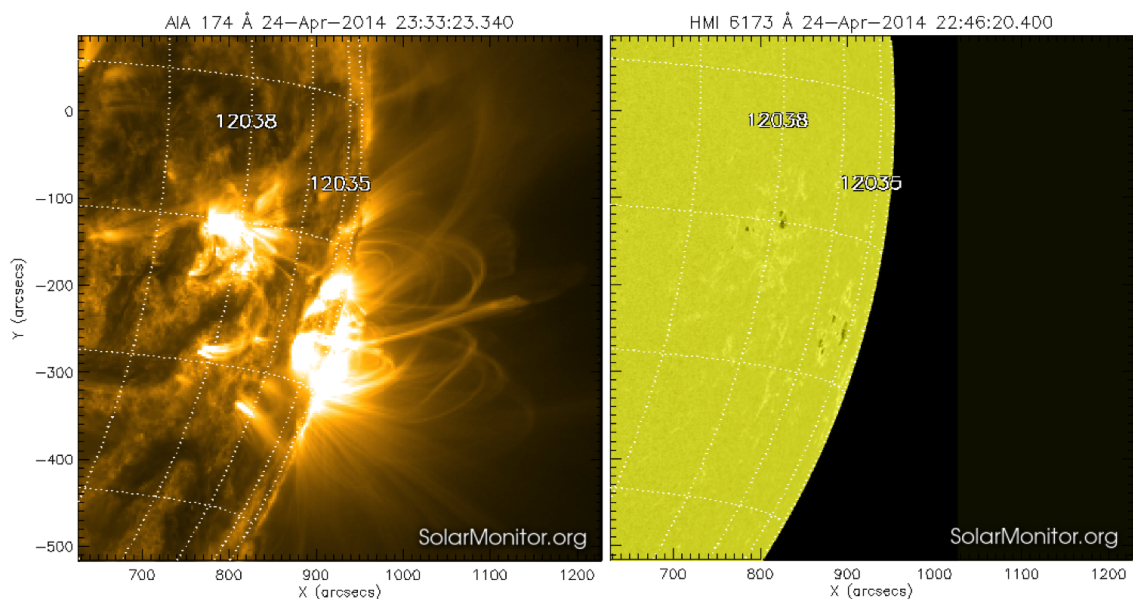
<http://proba2.sidc.be/FifthGICall>



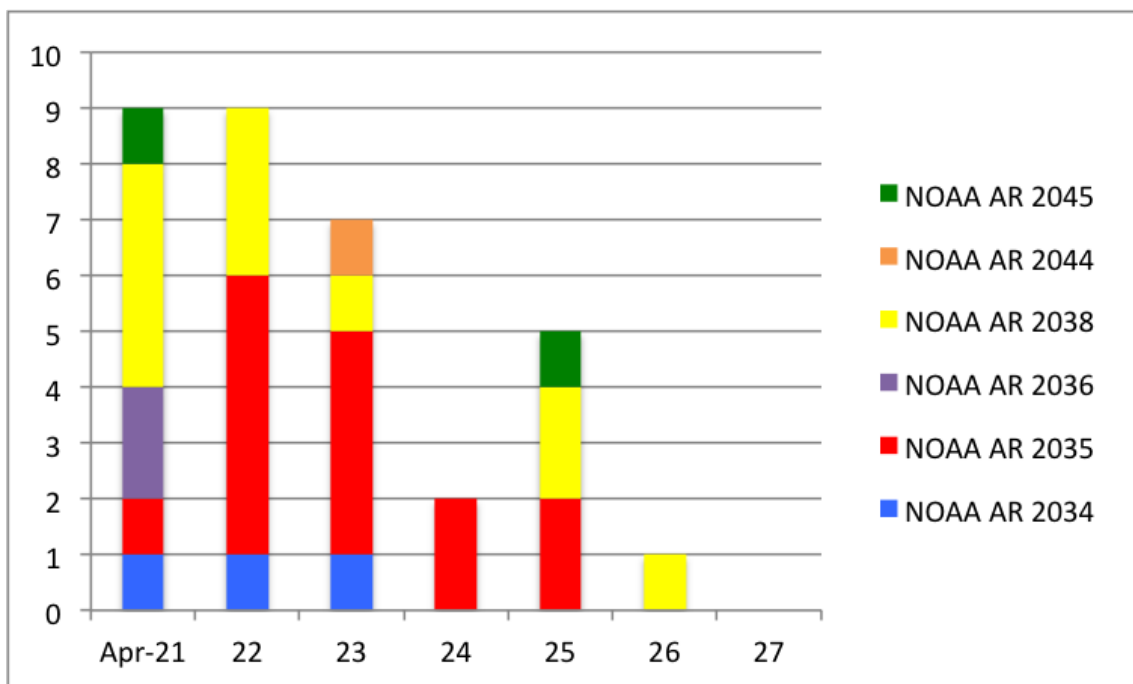
3. Review of solar and geomagnetic activity (21 Apr 2014 - 27 Apr 2014)

Solar Activity

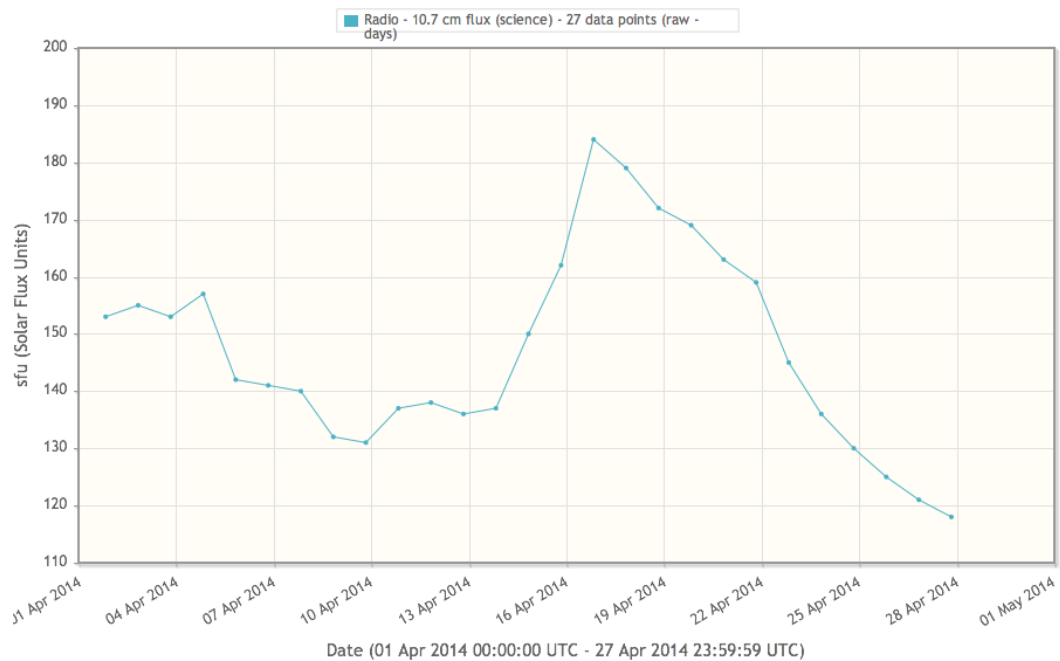
The strongest event of the week was an X1.3 flare that took place on 25 April (maximum at 00:27UT) in NOAA 2035 (see SDO/AIA pictures), which was at the time already 1 day behind the west limb. The associated CME was directed away from Earth.



The rest of the week saw only low-level C-class flaring, in particular from NOAA 2035 and 2038. The daily number of flares gradually declined as first active regions NOAA 2034 and 2036 (23 April), then NOAA 2035 (24 April) and finally NOAA 2038 (26 April) turned around the west limb. No C-class flares were observed on 27 April, compared to 9 on both 21 and 22 April. The chart below shows the number of >B flares assigned to a NOAA active region from 21 to 27 April.



This activity decrease over the week was also reflected in various other solar parameters, such as the x-ray background flux and solar radio flux (i.e. 10 cm flux), which gradually decreased resp. from B8- to B3-level and from 159 to 118 sfu. The graph below shows the 10cm flux (sfu) for from April 1 to 27. No CMEs with an earth-directed component were observed.



A small coronal hole passed the central meridian on 24 April.

Geomagnetic Activity

In the wake of the CME-impact (20 April) related to the M7-flare (18 April), the geomagnetic field was initially rather active (21 April). For the remainder of the week, quiet geomagnetic conditions with locally an occasional active period were recorded.

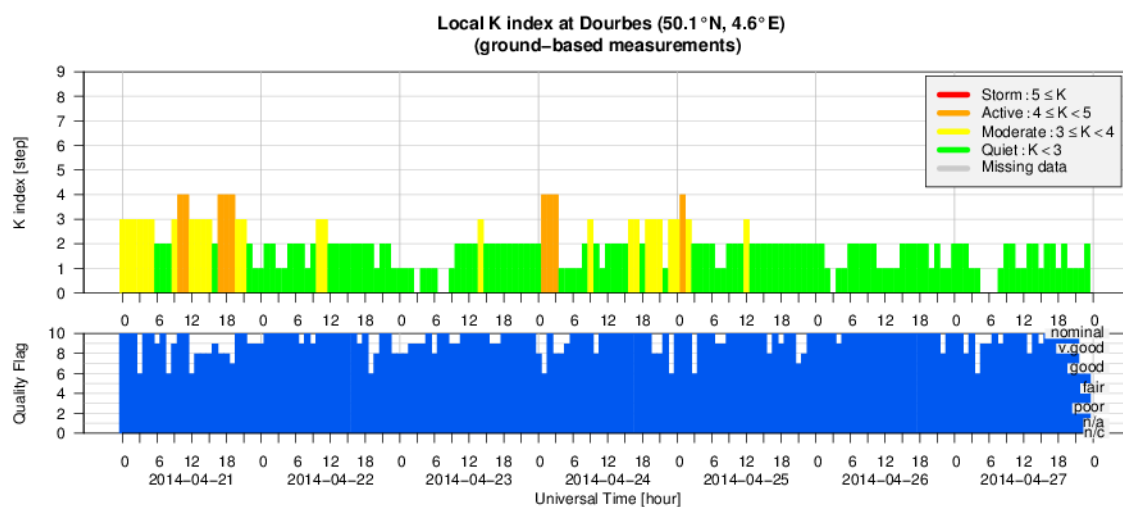
4. Noticeable Solar Events (21 Apr 2014 - 27 Apr 2014)

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA
25	0017	0027	0038	S15W90	X1.3	SF	1100	V/1III/2		2035

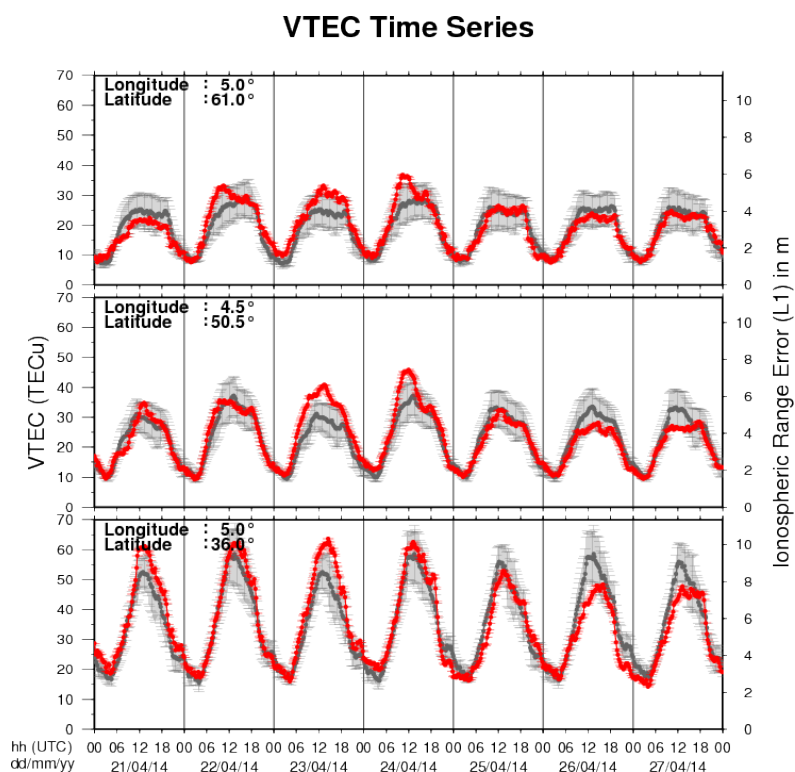
LOC: approximate heliographic location
 XRAY: X-ray flare class
 OP: optical flare class
 10CM: peak 10 cm radio flux

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

5. Geomagnetic Observations at Dourbes (21 Apr 2014 - 27 Apr 2014)



6. Review of ionospheric activity (21 Apr 2014 - 27 Apr 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 $\text{TECu} = 10^{16}$ 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>

STCE workshop on degradation and inter-calibration of instruments observing in the SXR-EUV range in Brussels, Belgium

Start : 2014-06-10 - End : 2014-06-11

The STCE workshop 'Inter-Calibration and Degradation of EUV Instruments' aims at understanding the differences observed between the various instruments observing in the SXR-EUV range and at analyzing the ageing effects that affect their results. It targets imagers as well as spectrometers and photometers. The workshop will be followed by two days of working sessions (June 12-13) organized by the Solar EUV Irradiance Working Group (also supported by the STCE). These working sessions are in the continuity of similar events organized in 2011, 2012 and 2013, but they are open to new participants and you are welcome to join if you are interested.

Website:

<http://www.stce.be/euvworkshop2014/>

3rd SWARM science meeting in Copenhagen, Denmark

Start : 2014-06-19 - End : 2014-06-20

During the summer of 2014 DTU Space will host the 3rd Swarm Science Meeting, sponsored by the European Space Agency, ESA . This meeting will take place at the IDA Conference Centre in Copenhagen on June 19th to 20th 2014 and is open to the science community at large.

Website:

<http://congrexprojects.com/2014-events/Swarm/home>

8. New documents in the European Space Weather Portal Repository

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

STCE Annual Report 2012

The STCE Annual Report 2012 is a compilation of the activities done in 2012 within the frame of the Solar-Terrestrial Centre of Excellence (STCE). This report continues the style from the previous edition. Hence, as it is targeting a more general public, it presents only a selection of the 2012-activities in easy-to-digest summaries. These summaries emphasize the intense collaboration between the institutes at the Space Pole, as well as with our external partners. We hope you enjoy this report, which features articles on the evolution of the solar activity, the 9th European Space Weather Week, PROBA2, Integrated Water Vapor observations, SIMBA the nanosatellite, user applications such as STAFF, LIDAR, and ionospheric models, and much more... Happy reading!

<http://www.spaceweather.eu/en/repository/show?id=494>

eHEROES - CME tracking from STEREO image data de-projected by different methods

<http://www.spaceweather.eu/en/repository/show?id=492>

eHEROES - Systematic testing of different de-projection methods for STEREO imagery

<http://www.spaceweather.eu/en/repository/show?id=497>

eHEROES - Review on remote-sensing observations of successive CMEs and CME-CME interaction

<http://www.spaceweather.eu/en/repository/show?id=498>

STCE - PROBA Workshop: Belpo perspective

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on the perspective of Belpo on the PROBA series and the Belgian involvement in the European space programmes.

<http://www.spaceweather.eu/en/repository/show?id=501>

STCE - PROBA Workshop: small can be GREAT

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on the perspective of QinetiQ Space on the PROBA series.

<http://www.spaceweather.eu/en/repository/show?id=502>

STCE - PROBA Workshop: Proba-1 and -V from an EO perspective

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on Proba-1 and Proba-V as part of the ESA's Earth Observation Programme.

<http://www.spaceweather.eu/en/repository/show?id=503>

STCE - PROBA Workshop: PROBA2

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet about the PROBA2 science operations.

<http://www.spaceweather.eu/en/repository/show?id=504>

STCE - PROBA Workshop: PROBA-V

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on the new operational mission PROBA-V, an earth observing satellite.

<http://www.spaceweather.eu/en/repository/show?id=505>

STCE - PROBA Workshop: Operation

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet about the operations at the PROBA satellites "nursery".

<http://www.spaceweather.eu/en/repository/show?id=506>

STCE - PROBA Workshop: PROBA-V experimental moon calibration method

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on a PROBA-V experimental moon calibration method.

<http://www.spaceweather.eu/en/repository/show?id=507>

STCE - PROBA Workshop: EPT onboard PROBA-V

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on the instrument aspects, operations and science of the Energetic Particle Telescope (EPT) onboard of PROBA-V.

<http://www.spaceweather.eu/en/repository/show?id=508>

STCE - PROBA Workshop: coronal imaging with PROBA2/SWAP

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on the challenges and successes of the coronal images SWAP onboard of PROBA2.

<http://www.spaceweather.eu/en/repository/show?id=509>

STCE - PROBA Workshop: Solar Irradiance Measurements with LYRA

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on the Large-Yield Radiometer (LYRA) onboard of PROBA2. LYRA measures the solar irradiance in 4 bandpasses with 3 types of detectors.

<http://www.spaceweather.eu/en/repository/show?id=510>

STCE - PROBA Workshop: micro-cameras on PROBA-1 and 2

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on the results and operations of the micro-cameras onboard of PROBA-1 and PROBA2.

<http://www.spaceweather.eu/en/repository/show?id=511>

STCE - PROBA Workshop: LEO impacts

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on the impacts of the Low Earth Orbit radiation environment on PROBA satellites.

<http://www.spaceweather.eu/en/repository/show?id=512>

STCE - PROBA Workshop: ALTIUS

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on ALTIUS, an Atmospheric Limb Tracker for Investigation of the Upcoming Stratosphere.

<http://www.spaceweather.eu/en/repository/show?id=513>

STCE - PROBA Workshop: PROBA-3

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on the future PROBA-3 satellite. PROBA-3 consists of 2 spacecraft flying in formation. The inner-satellite acts as the occulter for a chronograph observing the solar atmosphere.

<http://www.spaceweather.eu/en/repository/show?id=514>

STCE - PROBA Workshop: OLIVIA

Presentation given at the STCE Workshop Science and science operations of the PROBA satellite fleet on the study of a Passive Companion Micro-Satellite to the SAOCOM-1B Satellite of Argentina, for bistatic and interferometric SAR applications.

<http://www.spaceweather.eu/en/repository/show?id=515>

STCE - Tomography workshop: 3D propagation of CMEs

Presentation given at the STCE Workshop Tomography and 3D reconstruction in space science, April 2014 on 3D CME reconstruction: constraints, methods and an application.

<http://www.spaceweather.eu/en/repository/show?id=516>

STCE - Tomography workshop: SDO/AIA 3D temperature/density reconstructions of the solar corona

Presentation given at the workshop Tomography and 3D reconstruction in space science, April 2014 on temperature and density reconstruction of coronal structures. The technique which is based on Python is applied to polar plumes observed in SDO/AIA images.
<http://www.spaceweather.eu/en/repository/show?id=517>

STCE - Tomography workshop: Tomography at all scales

Presentation given at the workshop Tomography and 3D reconstruction in space science, April 2014 about the work performed at Vision Lab ASTRA: All Scale Tomographic Reconstruction Antwerp.
<http://www.spaceweather.eu/en/repository/show?id=518>

STCE - Tomography workshop: estimates of energy of electron precipitation above auroral arcs

Presentation given at the workshop Tomography and 3D reconstruction in space science, April 2014 on how the 2D energy spectra of electron above the auroral arcs are estimated. The technique uses optical ground-based observations done with ALIS, Auroral Large imaging System.
<http://www.spaceweather.eu/en/repository/show?id=519>

eHEROES - where Space Weather and Communication meet

Raising awareness and get people outside the scientific community involved in space weather becomes more and more an issue. To cross the borders of our science project eHEROES, we came up with a tide communication plan that answers the questions: what, to whom, why, when, how, by whom? The key is to link the audience and your message in a correct way. Both formal and informal education are on our tool list. This is an invited poster presented at EGU, 2014 in the session Raising and maintaining awareness of our local space weather: education and public outreach. eHEROES, Environment for Human Exploration and RObotic Experimentation in Space is an FP7 project (n° 284461, www.eheroes.eu).
<http://www.spaceweather.eu/en/repository/show?id=520>