

# STCE Newsletter

1 Dec 2014 - 7 Dec 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.

Content	Page
1. ESWW: a recipe for science and fun	2
2. Cruise the sun-earth system with STAFF	2
3. PROBA2 Observations (1 Dec 2014 - 7 Dec 2014)	4
4. Review of solar activity (1 Dec 2014 - 7 Dec 2014)	5
5. Noticeable Solar Events (1 Dec 2014 - 7 Dec 2014)	6
6. Review of geomagnetic activity	6
7. Geomagnetic Observations at Dourbes (1 Dec 2014 - 7 Dec 2014)	8
8. Review of ionospheric activity (1 Dec 2014 - 7 Dec 2014)	9
9. Future Events	10
10. New documents in the European Space Weather Portal Repository	11

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## 1. ESWW: a recipe for science and fun

The European Space Weather Week 11 has been a success as proved by more than 400 registered participants that could attend 14 sessions, 20 splinter meetings and the plenary session of the ESA Space Weather Working Team: a very rich and varied programme that makes this event the European forum for end users, industries, forecasters, scientists, young researchers and students.

Hence, we want herewith to thank all participants, which has contributed to this success.

We hope to welcome to at the European Space Weather Week 12 that will take place in Belgium in the second half of November 2015.

With Kind Regards,

Mauro Messerotti, Chair of the ESWW Programme Committee

Ronald van der Linden, Chair of the ESWW Local Organising Committee



ESWW has always been one of the most photographed conferences ever. More photos on <http://www.stce.be/esww11/photo.php>

## 2. Cruise the sun-earth system with STAFF

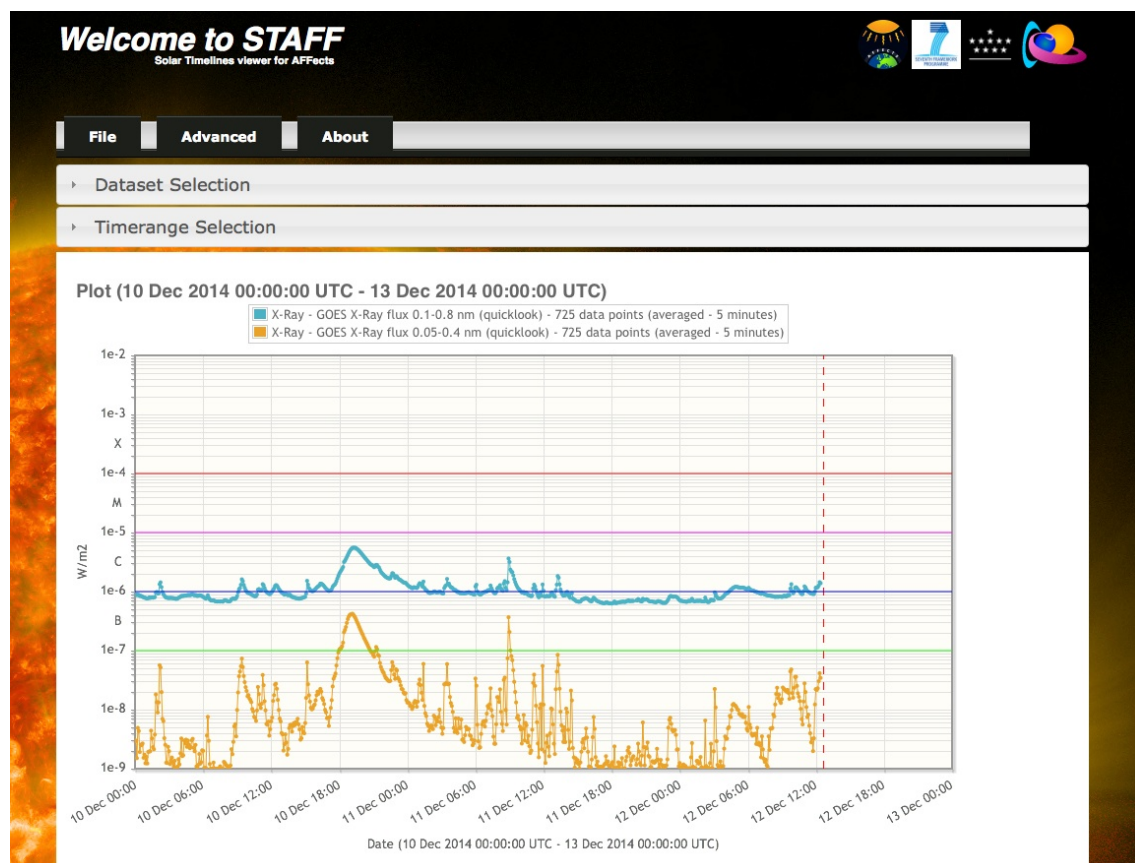
If you are looking for solar, solar wind, and earth environment data at a glance and you want to see them on a timeline, even if you are not a computer expert: STAFF has it all.



STAFF is a dynamic online timeline viewer which allows you to plot and compare data with a few mouse clicks. The data includes x-ray, sunspots, radio measurements, proton and electron flux near Earth, solar wind and interplanetary magnetic field parameters, geomagnetic and ionospheric data, and readings from EUV solar images.

The nice thing is that you can increase the number of data points if you want higher time resolution. You can zoom in just like that. Or you can let the program choose the optimal sample interval for your desired timespan. You can make your science graphs even more exciting by picking your favourite colour!

Start your 2 dimensional cruise through the sun-earth system:  
<http://www.staff.oma.be/>



### 3. PROBA2 Observations (1 Dec 2014 - 7 Dec 2014)

#### 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 245).

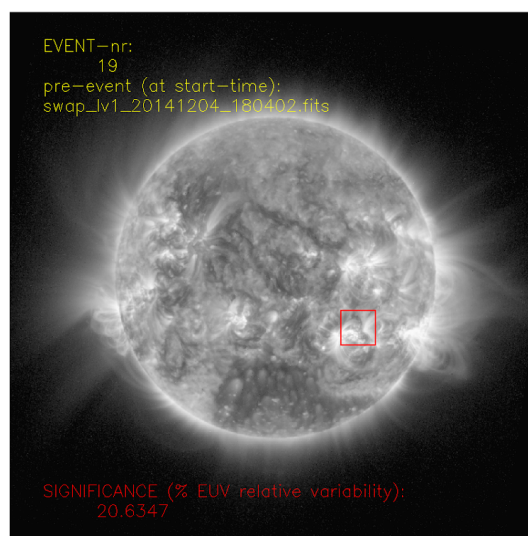
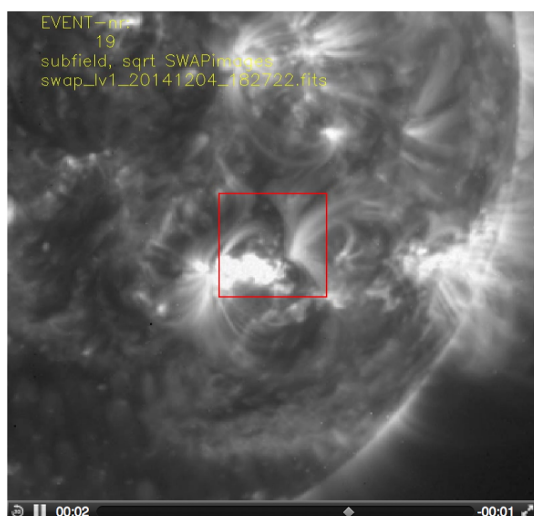
[http://proba2.sidc.be/swap/data/mpg/movies/weekly\\_movies/weekly\\_movie\\_2014\\_12\\_01.mp4](http://proba2.sidc.be/swap/data/mpg/movies/weekly_movies/weekly_movie_2014_12_01.mp4)

Details about some of this week's events:

Below we provide SWAP images of the time when a strong M-flare occurred on Thursday. These annotated snapshots are produced by the Solar Feature Automated Search Tool (SoFAST). This tool detects dynamic solar events in EUV images from SWAP in real-time. More info on <http://www.sidc.be/sofast>.

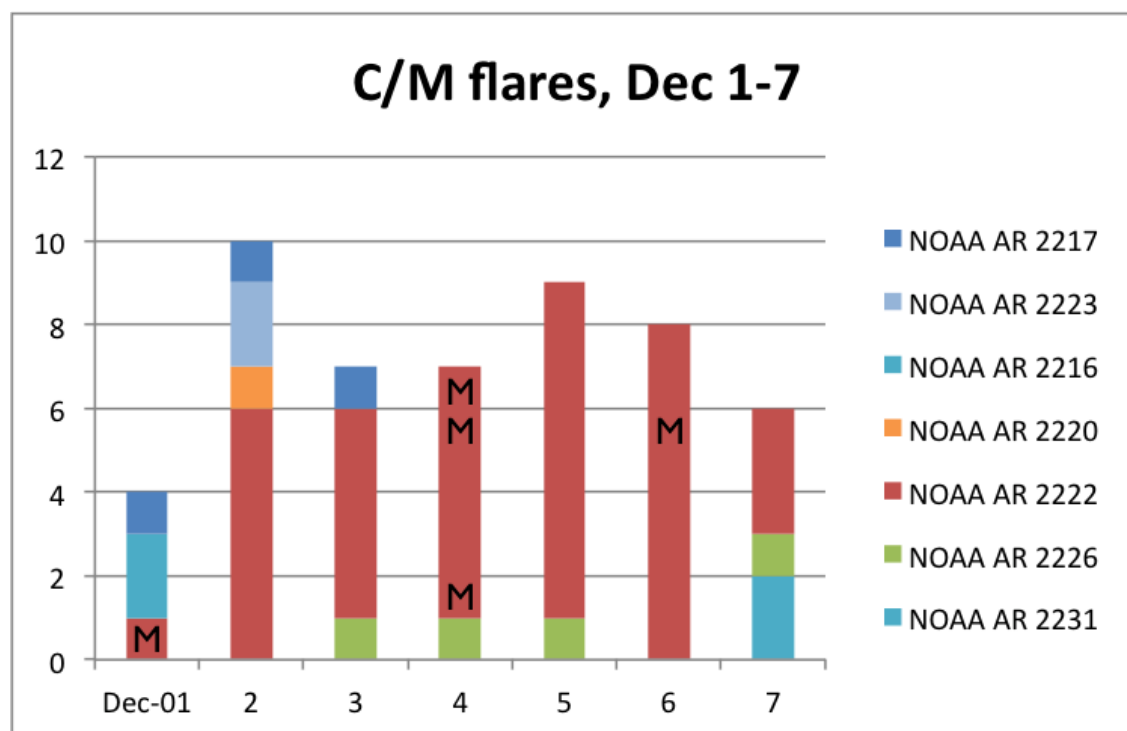
#### Thursday Dec 04:

M6.1 flare peaking around 18h25

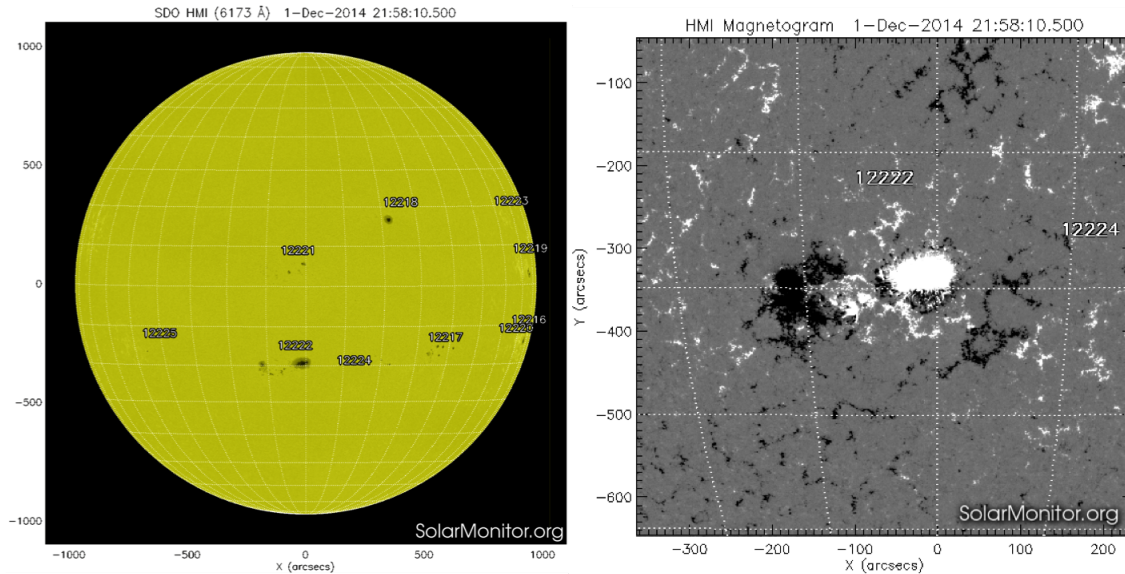


#### 4. Review of solar activity (1 Dec 2014 - 7 Dec 2014)

During last week, flaring activity was mostly at the C-class level (46 C-class flares reported), with addition of five confined M-class flares (no associated CMEs observed). An isolated M1.8 flare (peaking at 06:41UT) was reported on December 01. Three M-class flares (M1.3, M6.1, and M1.3) were reported on December 04 (peaking at 08:10, 18:25, and 19:41 UT, respectively). The last of the reported M-class during this week was the M1.5 flare on December 05 (peaking at 12:25UT). The M-class flares, as well as 32 C-class flares originated from the Catania sunspot group 24 (NOAA AR 2222), which kept beta-gamma configuration of its photospheric magnetic field during the whole week.







The left picture by SDO/HMI shows the sunspot group associated with NOAA AR 2222 on Dec 1 when it was near the central meridian. The right picture is a magnetogram that shows in which areas the (line of sight) magnetic field is concentrated.

No wide, Earth-directed CMEs were observed this week.

## 5. Noticeable Solar Events (1 Dec 2014 - 7 Dec 2014)

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA
01	0626	0641	0659	S21E17	M1.8	1N			24	2222
04	0800	0810	0821	S24W27	M1.3	1N			24	2222
04	1805	1825	1856		M6.1				24	2222
04	1938	1941	1944		M1.3				24	2222
05	1133	1225	1247		M1.5			CTM/1	24	2222

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

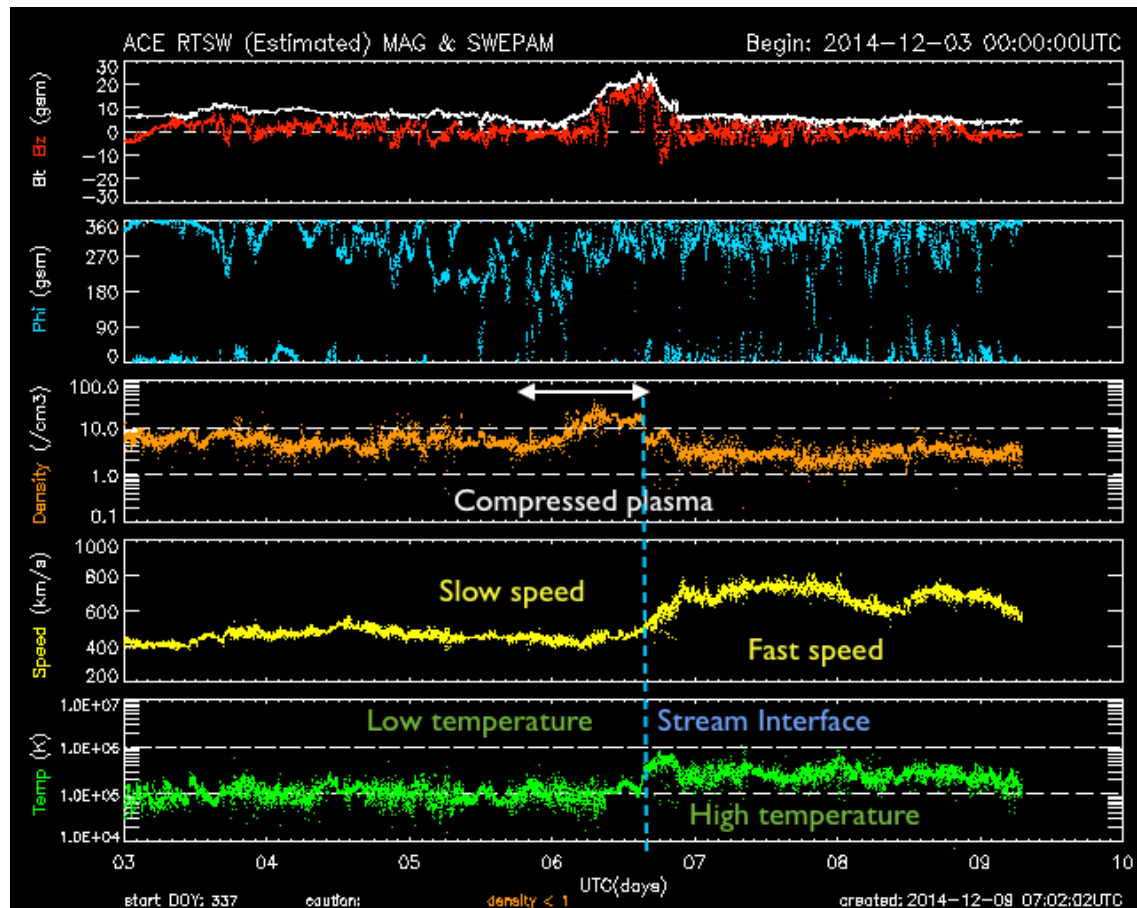
NOAA: NOAA active region number

## 6. Review of geomagnetic activity

The week started with the arrival of the fast solar wind, on the midday of December 01. The fast flow was associated with the extended low-latitude coronal hole (between N25 and N70) which reached central meridian on the morning of November 26 (transition of the coronal hole across the central meridian lasted more than two days). The solar wind speed increased to about 600 km/s (evening of December 01 and morning of December 02), and the interplanetary magnetic field magnitude was slightly enhanced amounting about 12 nT. The solar wind speed decrease to 400 km/s in the morning of December 03 and it was fluctuating around this value until December 06.

The fast solar wind originating from the large polar coronal hole with the extent to the low latitudes (up to about S40) arrived at the Earth on December 06. The interface between the slow and fast solar wind is a compression region where the density and the magnetic field strength have elevated values. The decrease of density and the strong increase of the solar wind speed and temperature (observed at about

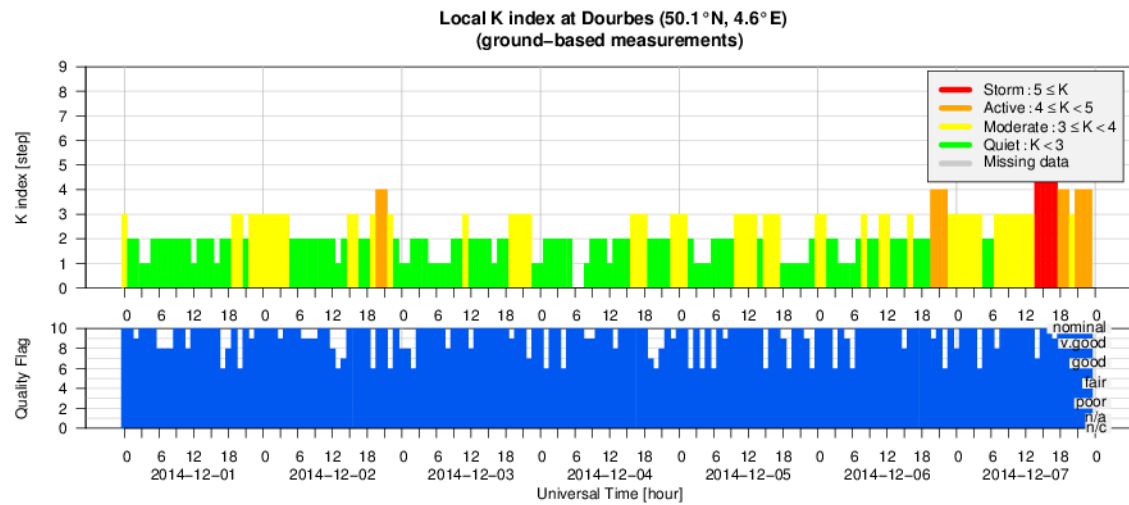
16:00 UT on December 6), indicated the arrival of the fast flow itself. The maximum solar wind speed of about 820 km/s was observed on December 07. The highest value of the interplanetary magnetic field magnitude of about 25nT, was recorded at about 15:00 UT on December 6. The slow and fast speed, low and high temperature, compression region is indicated in the graph below. The solar wind parameters are measured by ACE at the L1 point.



The arrival of the first high speed stream observed this week resulted in the unsettled to active geomagnetic conditions (K=4 was reported by IZMIRAN and Dourbes, and NOAA reported Kp=4) in the evening of December 01 and during December 02.

Due to arrival of the fast flow on December 06, few intervals of negative values of the Bz component of the interplanetary magnetic field (down to -14 nT at about 18:30 UT on December 6) were reported. This induced active to minor storm geomagnetic conditions lasting from about 18:00 UT on December 6 until midnight of December 07 (the local stations at Dourbes and Izmiran reported values of K=5, and NOAA reported two intervals of Kp=5).

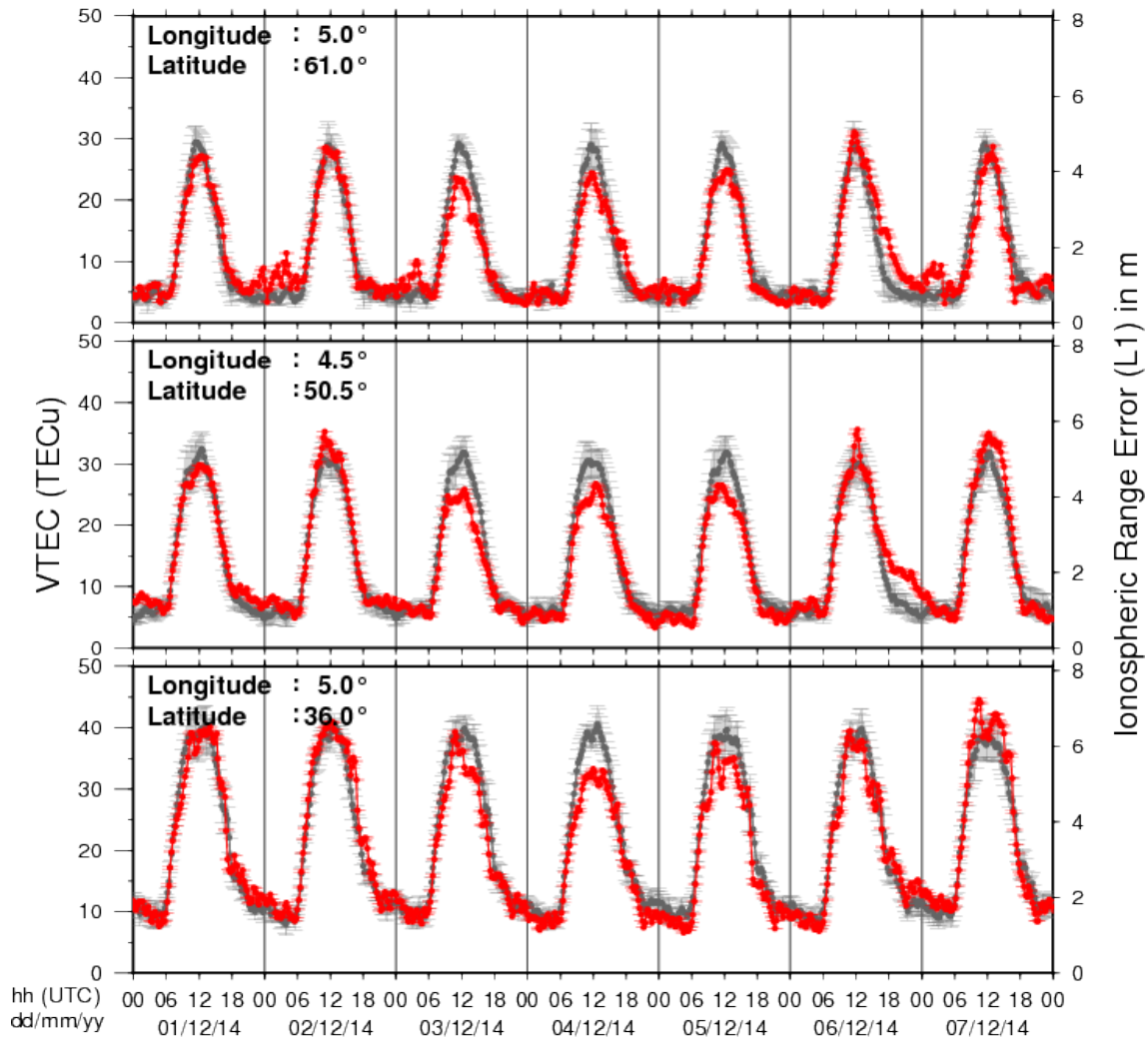
## 7. Geomagnetic Observations at Dourbes (1 Dec 2014 - 7 Dec 2014)





## 8. Review of ionospheric activity (1 Dec 2014 - 7 Dec 2014)

### VTEC Time Series



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](http://stce.be/newsletter/GNSS_final.pdf) for some more explanations ; for detailed information, see [http://gnss.be/ionosphere\\_tutorial.php](http://gnss.be/ionosphere_tutorial.php)

## **9. Future Events**

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

### **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>

### **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, H $\alpha$ , 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/>

## **10. New documents in the European Space Weather Portal Repository**

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

### **STCE - Les éruptions solaires: quand notre astre se fâche**

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

### **eHEROES - Zonnestormen tijdens Zonnecyclus 24**

Lecture focusing on the effects of space weather, extreme space weather during SC24, and the space weather forecasting at the Space Pole (RWC Brussels). The lecture was given to the Public Observatory Beisbroek / COZMIX in Beisbroek, Brugge, Belgium. Solar amateur astronomers and public audience, in Dutch, about 35 attendees.

<http://www.spaceweather.eu/en/repository/show?id=554>

### **ESWW11 - Flaring activity in NOAA 2158**

This presentation was given during the "ESWW11 – Forecaster Forum" splinter on 18 November 2014. It focuses on the forecast and evaluation of the flaring activity in sunspot group NOAA 2158 (September 2014). There were about 70 attendees (scientists).

<http://www.spaceweather.eu/en/repository/show?id=555>