

STCE Newsletter

14 Jul 2014 - 27 Jul 2014



Published by the STCE - this issue : 31 Jul 2014. Available online at <http://www.stce.be/newsletter/>.

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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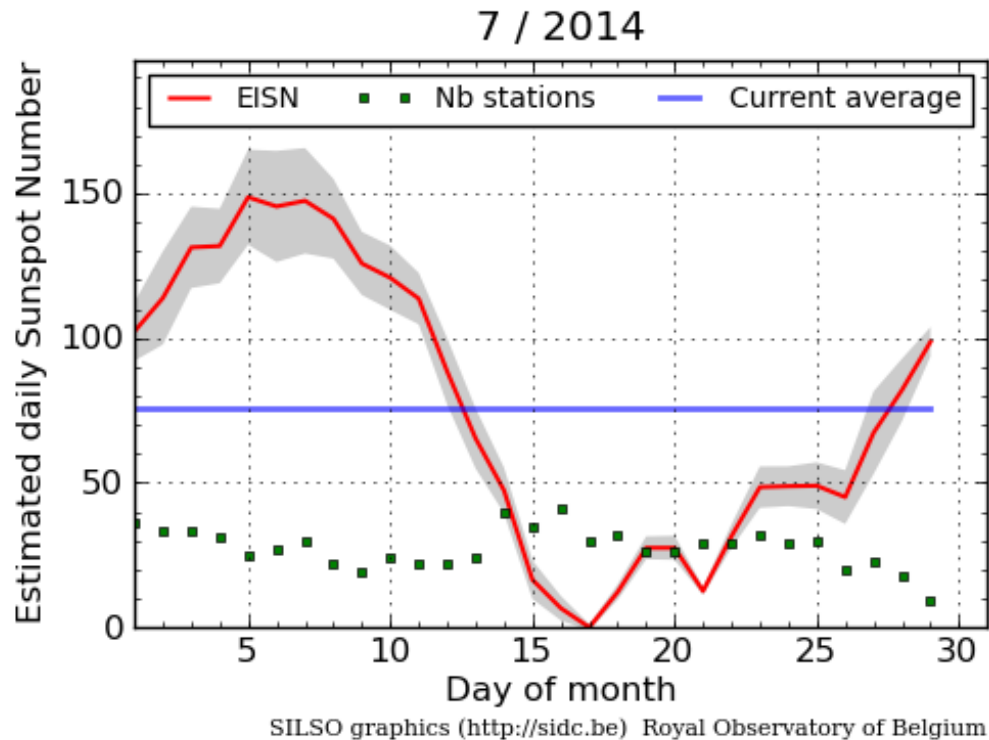
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Petra Vanlommel

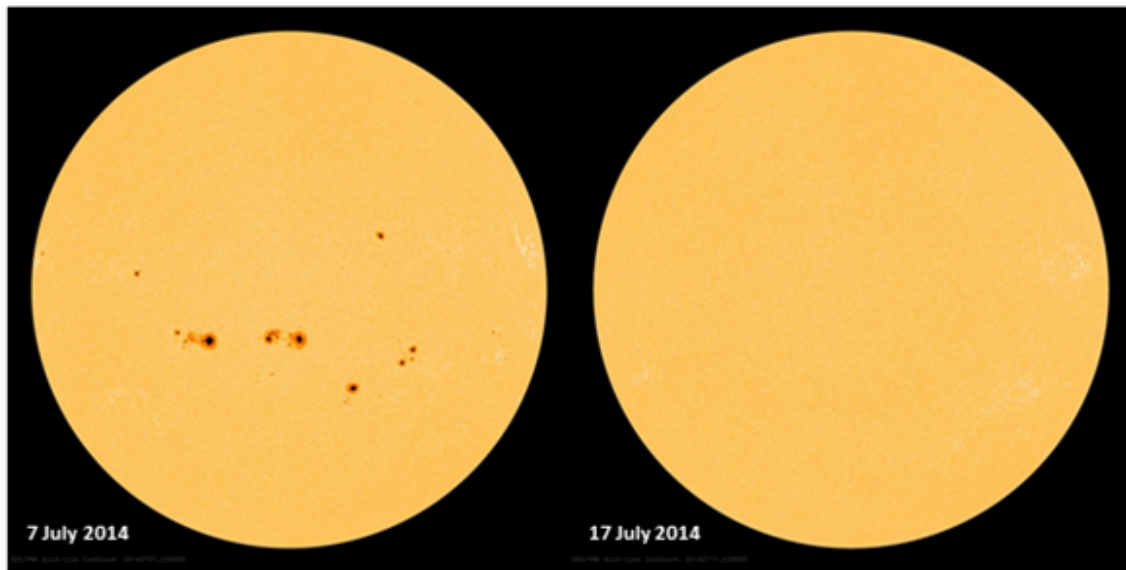
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1. Tour de France

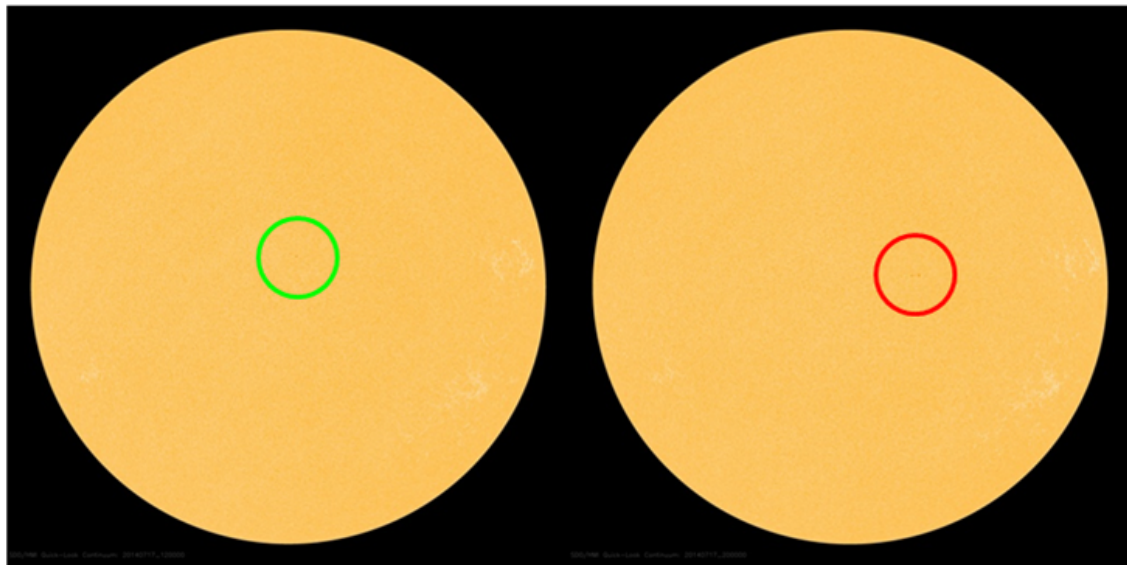
The Sun had its own mountain stage this month, with soaring sunspot numbers during the first week, then a fast decline until sea-level values (that is: zero sunspots) were reached on the 17th, followed by a gradual recovery to more moderate sunspot numbers. This can be seen in the evolution of the estimated daily sunspot number as compiled by SILSO on the SILSO website (<http://sidc.oma.be/silso/>), as shown in graph underneath.



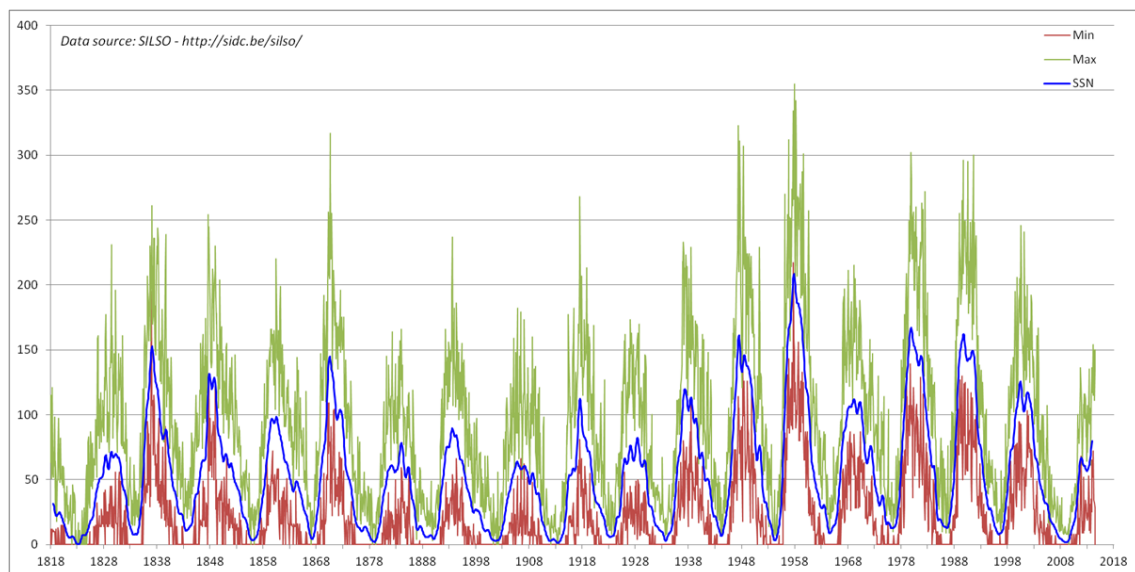
The high number of sunspots early this month was already discussed in a previous newsletter (see <http://www.stce.be/news/260/welcome.html>). Despite the numerous and complex sunspot groups, only 4 M-class flares were recorded during the first 10 days of July. Things got worse, as all the sunspot groups one-by-one rounded the west limb, and the solar surface got devoid of any freckles. The SDO-images (<http://sdo.gsfc.nasa.gov/data/aiahmi/browse/>) underneath show the Sun on 7 and 17 July: Quite a difference! There was even an "all quiet alert" in place from 16-24 July (see this newsletter <http://stce.be/news/159/welcome.html> for more information).



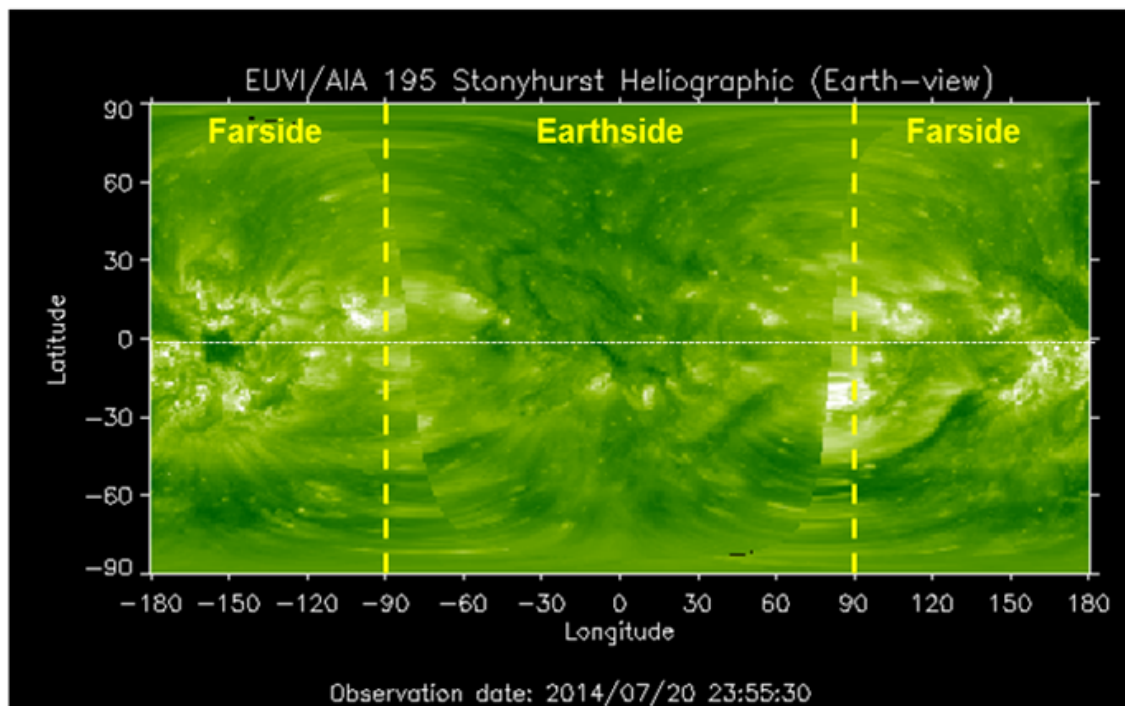
The zero value of the sunspot number for the 17th is still preliminary. Indeed, observers early on the day correctly reported no spots, but observers taking a look at the Sun during the afternoon or evening hours could see the rise and fall of a sun speck, and -starting around 18:00UT- the development of a small bipolar group, as can be seen in the SDO-images underneath (resp. at 12:00 and 20:00UT; <http://sdo.gsfc.nasa.gov/>).



Assuming the final sunspot number on 17 July will be zero, one could question how often this happens. After all, this is solar maximum, isn't it? Graph underneath puts things in perspective. It shows from 1818 onwards the (Meeus) smoothed monthly sunspot number (thick blue line), and for each month the highest and lowest value of the daily sunspot number (resp. green and red; data from WDC/SILSO at <http://sidc.oma.be/silso/datafiles>). The values for the last 4 months are preliminary.



As can readily be seen, it has been quite a while since we had a cycle maximum with a spotless day. This was the case especially during SC 7 (+/- 1830), 12 (+/- 1883) and 14 (+/- 1905). Just like ongoing Solar Cycle 24, it concerned moderate to weak solar cycles. It's also not so unusual that we have very high and (near) zero daily sunspot numbers within one and the same month during a cycle maximum. In July 1905, the sunspot number was 148 on the 15th, but 0 only half a solar rotation later on the 28th.



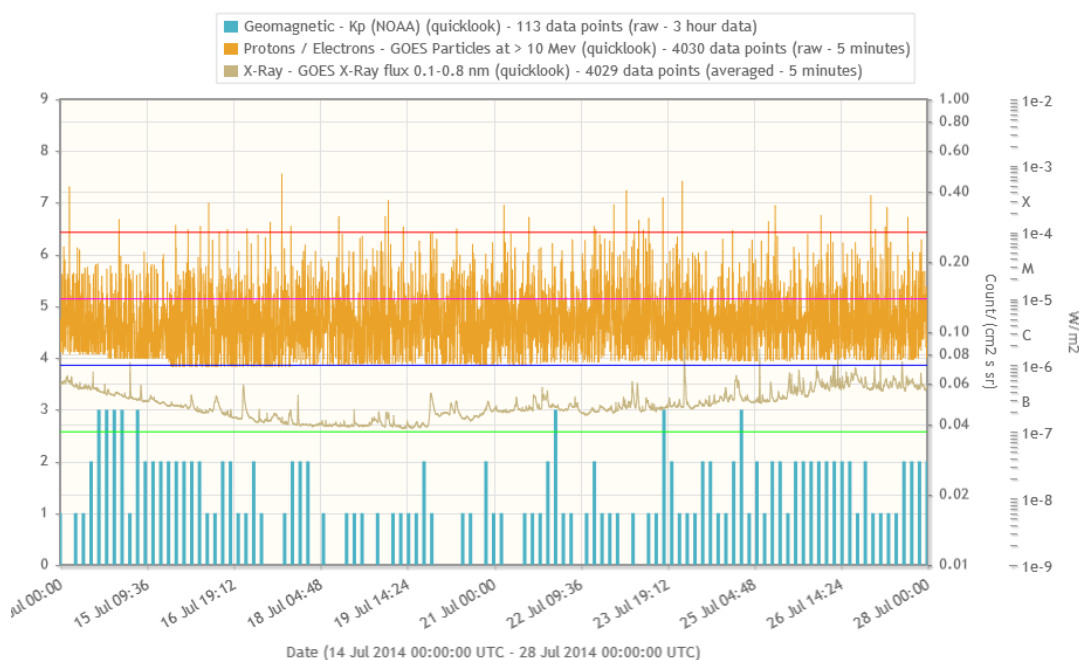
A spotless interval of only one or a few days does not necessarily mean that the Sun has become completely inactive over a full solar rotation, as there can still be a lot of activity in a limited longitudinal band. Such configurations often occur during the ascending and descending phases of stronger cycles, and are favored by a strong asymmetry in activity between the northern and southern solar hemispheres,

i.e. with only one hemisphere being active and almost no contribution from the other one as is currently the case with the weakly active northern hemisphere. So in this case, the longitudinal "gaps" of the active southern hemisphere were not filled by active longitudes of the northern hemisphere, whereas normally these gaps are filled at times of maximum activity. This can be seen in the above EUV-image from STEREO/SDO (http://stereo-ssc.nascom.nasa.gov/beacon/beacon_secchi.shtml), showing nearly no active (bright) regions on the Earth-directed hemisphere, most of them being on the farside and in the southern hemisphere.

2. Review of solar activity (14 Jul 2014 - 27 Jul 2014)

Solar activity was low to very low for the last two weeks. Only low-level C-class flares were recorded: On 14-15 July by NOAA 2109, and from 24 July onwards in a cluster of small sunspot groups. The strongest event was a C2.5 flare produced by NOAA 2125 on 27 July. Several observers reported a spotless solar disk on 17 July. No Earth directed CMEs were observed over the entire period.

An ALL-QUIET-ALERT was issued on 16 July and lifted on 24 July after the first C-class flare occurrence. Indeed, as can be seen in graph underneath, for the period of 16-23 July the solar X-ray output remained below C-class level, the Kp index (blue) remained well below 5, and the high-energy proton fluxes (orange) stayed far below the event threshold of 10 particle flux units.



3. PROBA2 Observations (14 Jul 2014 - 20 Jul 2014)

The level of solar activity was *low* to *very low* this week.

In order to view the activity of this week in more detail, we suggest going 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: http://proba2.oma.be/swap/data/mpg/movies/WeeklyReportMovies/WR225_Jul14_Jul20/weekly_movie_2014_07_14.mp4 (SWAP week 225).

Note the off-point campaigns at the beginning of this movie. They are the consequence of SWAP supporting a LYRA paving campaign, by off-pointing several times.

Except for a single weak flare occurrence on the South West limb and a few small prominence eruptions, no noteworthy solar events occurred this week.

4. PROBA2 Observations (21 Jul 2014 - 27 Jul 2014)

The level of solar activity evolved from *very low* to *low* this week.

In order to view the activity of this week in more detail, we suggest going 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: http://proba2.oma.be/swap/data/mpg/movies/WeeklyReportMovies/WR226_Jul21_Jul26/weekly_movie_2014_07_21.mp4 (SWAP week 226).

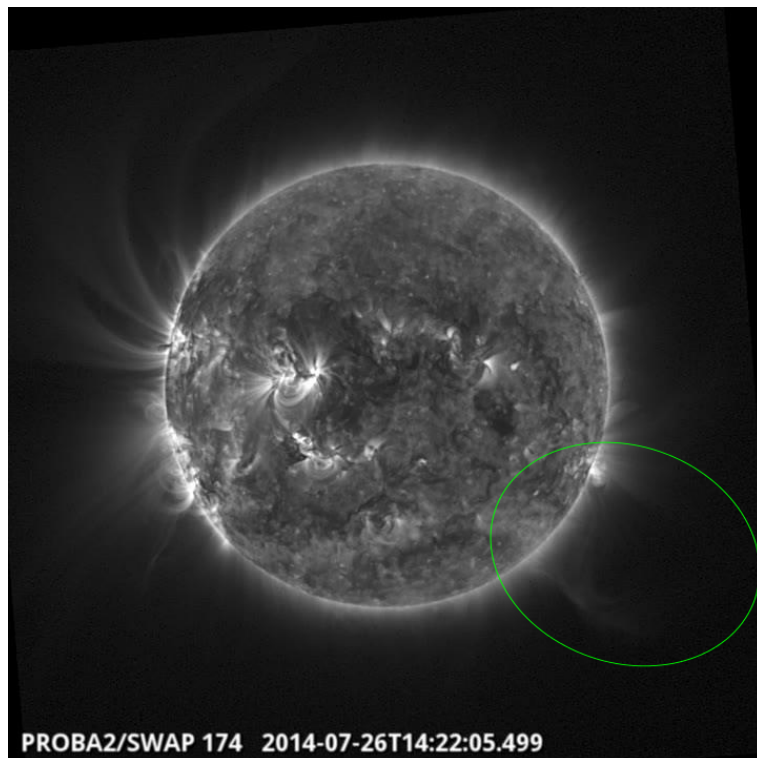
Details about some of this week's events, can be found further below.

Tuesday Jul 22



Prominence Eruption on north west limb @ 17:57 - SWAP difference image

Saturday Jul 26

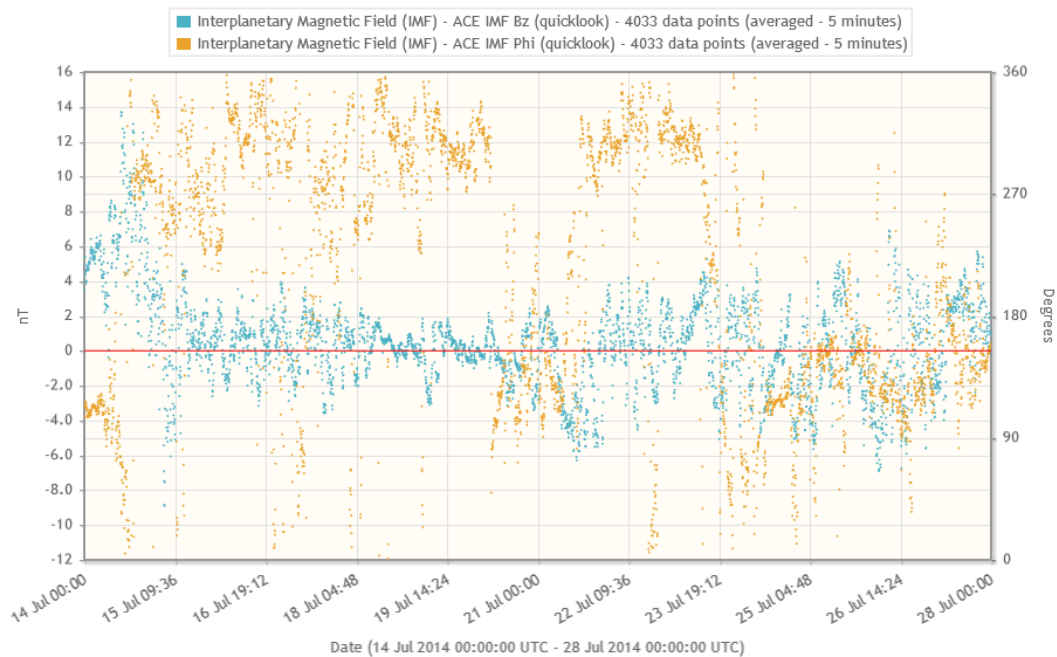


Prominence Eruption on south west limb @ 14:22 - SWAP image

Find a movie of the event here: http://proba2.oma.be/swap/data/mpg/movies/WeeklyReportMovies/WR226_Jul21_Jul26/20140726_PromEruption_SouthWestLimb_1422_SWAP.mp4 (SWAP movie) - for about 1.5 days ahead of eruption, the prominence shows quite some activity.

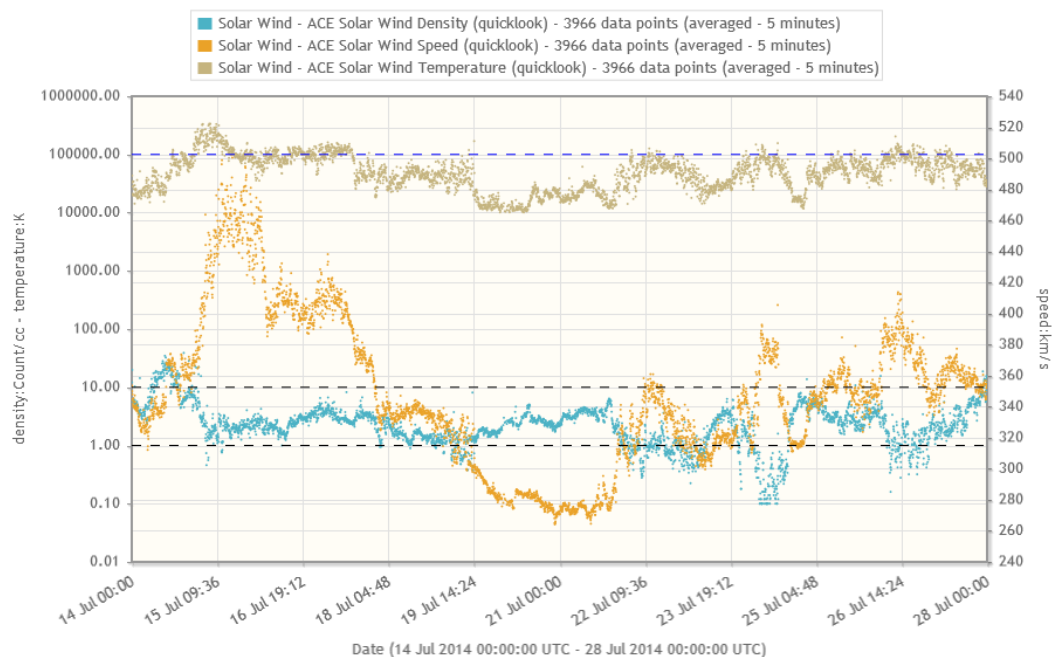
5. Review of geomagnetic activity (14 Jul 2014 - 27 Jul 2014)

During the last 2 weeks, geomagnetic conditions were mostly quiet with the exception of 14 July when a shock arrived at Earth (at 13:27 UT) and caused one active period at Dourbes ($K=4$). Some unsettled conditions that day were also related to a sector boundary crossing, as the interplanetary magnetic field (IMF) changed its direction from away to towards the Sun and stayed that way till 20 July.

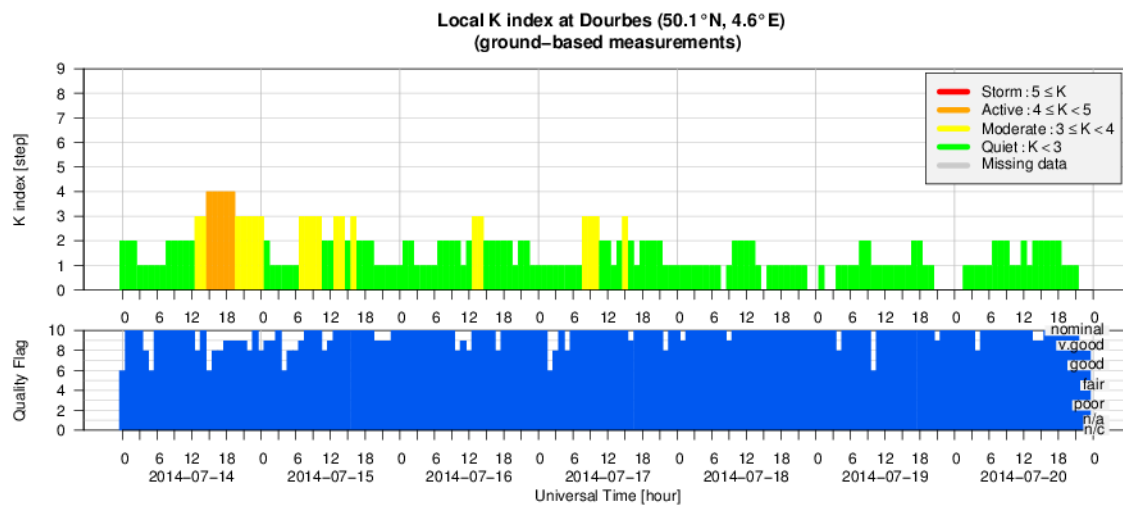


For the rest of the period, solar wind conditions were mainly nominal with some periods of slightly enhanced flow speeds (up to 425 km/s) related to sector boundary crossings which may have been modulated by the influence of coronal hole moderate speed streams. Total magnetic field reached maxima of around 8nT with variable Bz.

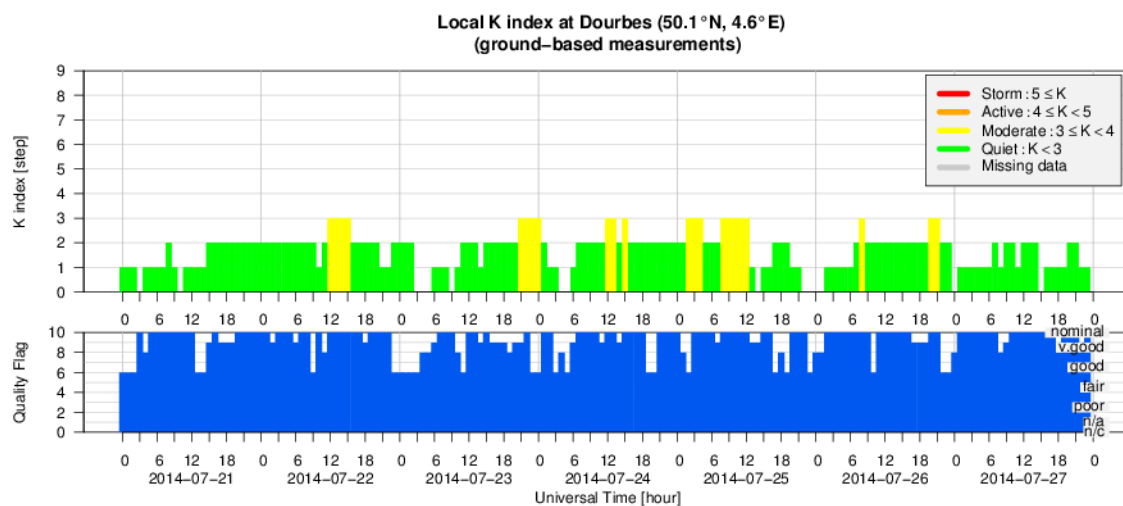
Geomagnetic conditions were quiet to unsettled, with NOAA Kp and local K Dourbes varying between 0 and 3.



6. Geomagnetic Observations at Dourbes (14 Jul 2014 - 20 Jul 2014)

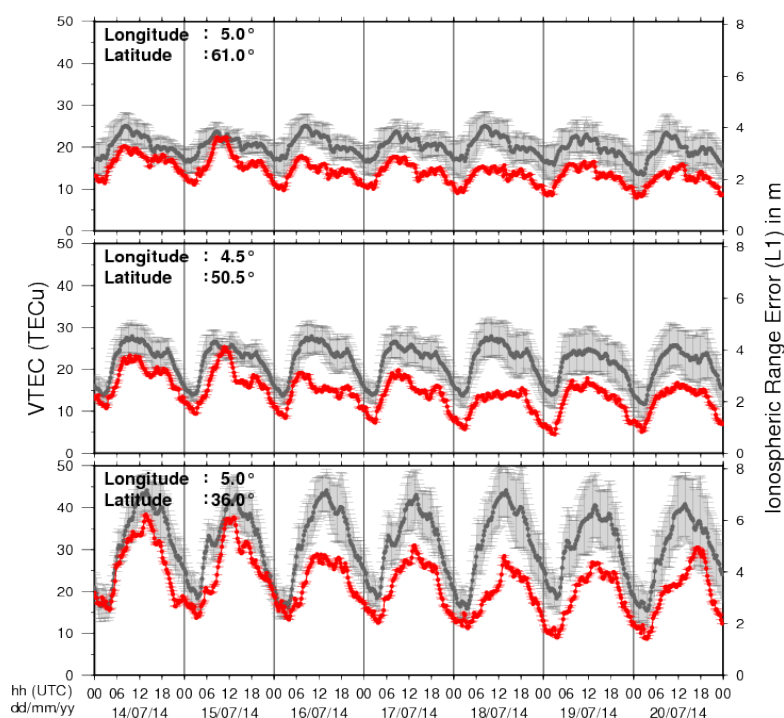


7. Geomagnetic Observations at Dourbes (21 Jul 2014 - 27 Jul 2014)



8. Review of ionospheric activity (14 Jul 2014 - 20 Jul 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.

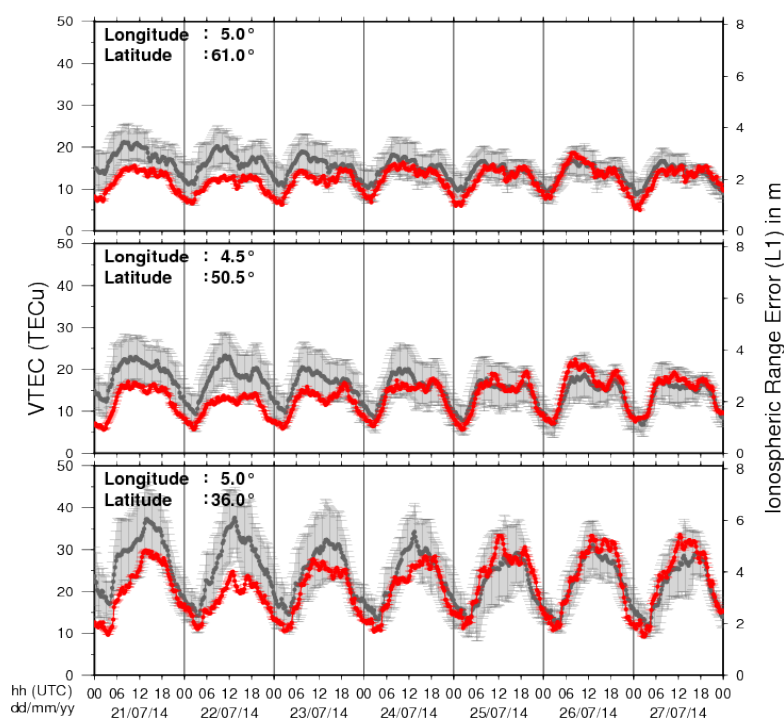
The VTEC is expressed in TECu (with $\text{TECu} = 10^{16}$ electrons per square meter) and is directly related to the signal propagation delay due to the ionosphere (in figure: delay on GPS L1 frequency).

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 for some more explanations ; for detailed information, see http://gnss.be/ionosphere_tutorial.php

9. Review of ionospheric activity (21 Jul 2014 - 27 Jul 2014)

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10. New documents in the European Space Weather Portal Repository

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

STCE workshop - UAV-based Antenna Pattern Measurements at Low Frequencies

Presentation given during the STCE workshop Modelling of antennas and calibration of radio instruments.

<http://www.spaceweather.eu/en/repository/show?id=526>

STCE workshop - Calibration of LOFAR antennas

Presentation given during the STCE workshop Modelling of antennas and calibration of radio instruments.

<http://www.spaceweather.eu/en/repository/show?id=527>

STCE workshop - Spectral and imaging solar observations at Nançay: calibration strategies and problems

Presentation given during the STCE workshop Modelling of antennas and calibration of radio instruments.

<http://www.spaceweather.eu/en/repository/show?id=528>

STCE workshop - Calibration of the BRAMS antenna and solar radio telescope in Huma

Presentation given at the STCE workshop Modelling of antennas and calibration of radio instruments, June 2014.

<http://www.spaceweather.eu/en/repository/show?id=529>

STCE workshop - Common methods for GNSS Antenna Calibration

Presentation given at the STCE workshop Modelling of antennas and calibration of radio instruments, June 2014.

<http://www.spaceweather.eu/en/repository/show?id=530>

STCE workshop - GNSS antenna calibration for mini-UAV

Presentation given at the STCE workshop Modelling of antennas and calibration of radio instruments, June 2014.

<http://www.spaceweather.eu/en/repository/show?id=531>

STCE workshop - Calibration of the AMISR phased array radar with local test antennas and modelling

Presentation given at the STCE workshop Modelling of antennas and calibration of radio instruments, June 2014.

<http://www.spaceweather.eu/en/repository/show?id=532>

STCE workshop - Phase-calibration of a 2-antenna ISR system

Presentation given at the STCE workshop Modelling of antennas and calibration of radio instruments, June 2014.

<http://www.spaceweather.eu/en/repository/show?id=533>

11. Future Events

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

European Planetary Science Congress 2014 in Cascais, Portugal

Start : 2014-09-07 - End : 2014-09-12

Planetary space weather can be characterised by changes in the ambient planetary magnetic field and plasma populations around the planetary environment while space climate refers to the long-term changes in space weather conditions. Space weather and space climate are driven by the changes in the Sun. The effects of Space Weather on the Earth's environment are well documented, particularly in terms of risk to satellites, communications and ground-based systems such as electrical power grids and pipelines. However, planetary space weather and space climate studies as well as better prediction models for space weather are needed. Typically differences in the magnetic field and plasma environment at different planets, as well as the distance of the planet from the sun drives different space weather effects as we move through the solar system. The use of solar wind propagation models combined with solar observations allows us to obtain and predict the interplanetary conditions around each planet.

We solicit papers on planetary as well as terrestrial space weather and space climate, where data from past and on-going space missions such as ACE, SOHO, SDO, MEX, VEX, MESSENGER and CASSINI is used. We welcome papers on observations as well as modeling of space weather and space climate in our solar system.

Website:

<http://meetingorganizer.copernicus.org/EPSC2014/session/16809>

Workshop on Radiation Monitoring for the International Space Station in Krakow, Poland

Start : 2014-09-09 - End : 2014-09-11

The Workshop on Radiation Monitoring for the International Space Station (WRMISS) has been held annually since 1996. The major purpose of WRMISS is to provide a forum for discussion of technical issues concerning radiation dosimetry aboard the International Space Station and other spacecraft. This includes discussion of new results, improved instrumentation, detector calibration, and radiation environment and transport models. The goal of WRMISS is to enhance international efforts to provide the best information on the space radiation environment in low-Earth orbit and on the exposure of astronauts and cosmonauts in order to optimize the radiation safety of space crew.

Website:

<http://www.ifj.edu.pl/conf/wrmiss/>

Geospace revisited: a Cluster/MAARBLE/Van Allen Probes Conference in Rhodos, Greece

Start : 2014-09-15 - End : 2014-09-20

The 'Geospace Revisited' conference aims at revisiting long-standing issues of geospace dynamic phenomena. New data from space missions like Cluster, THEMIS and the more recent Van Allen Probes, along with measurements from ground-based magnetometer arrays around the globe, processed with new methods and combined with theory and simulations are expected to shed light on the complex interplay of particles, fields and waves in geospace, and in particular the inner magnetosphere (radiation belts and ring current).

Website:

<http://geospacerev.space.noa.gr/index.php>

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>

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:

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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>