

# STCE Newsletter

15 Oct 2012 - 21 Oct 2012



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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.

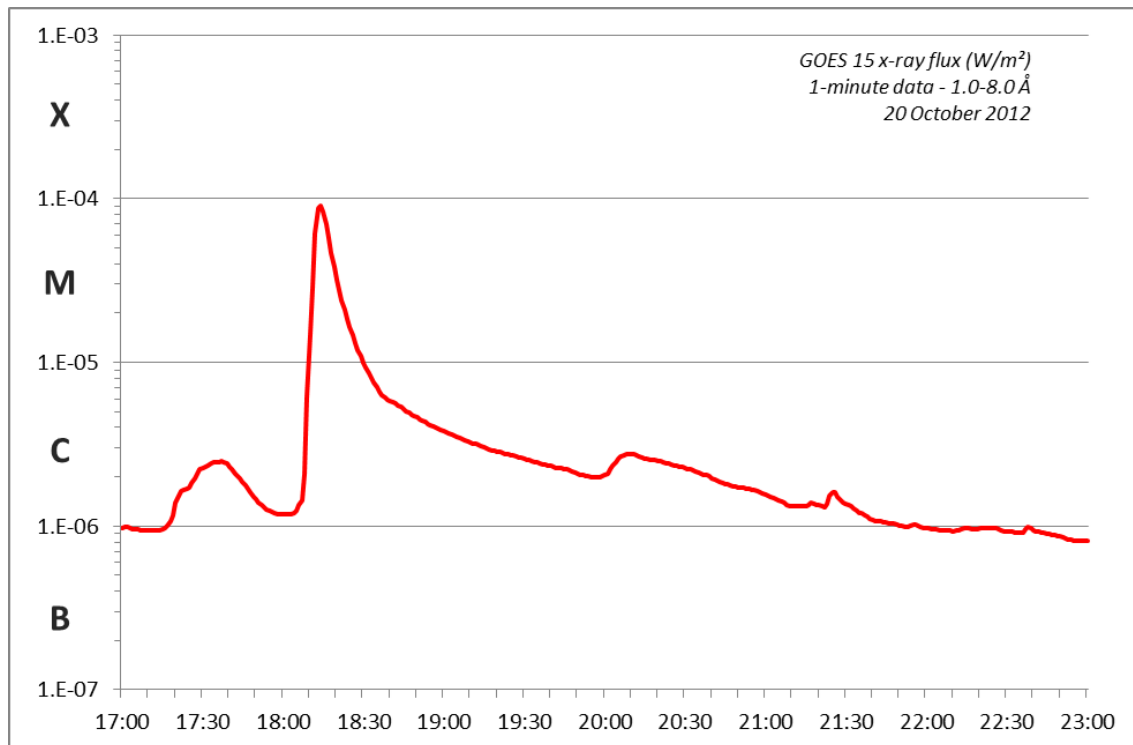
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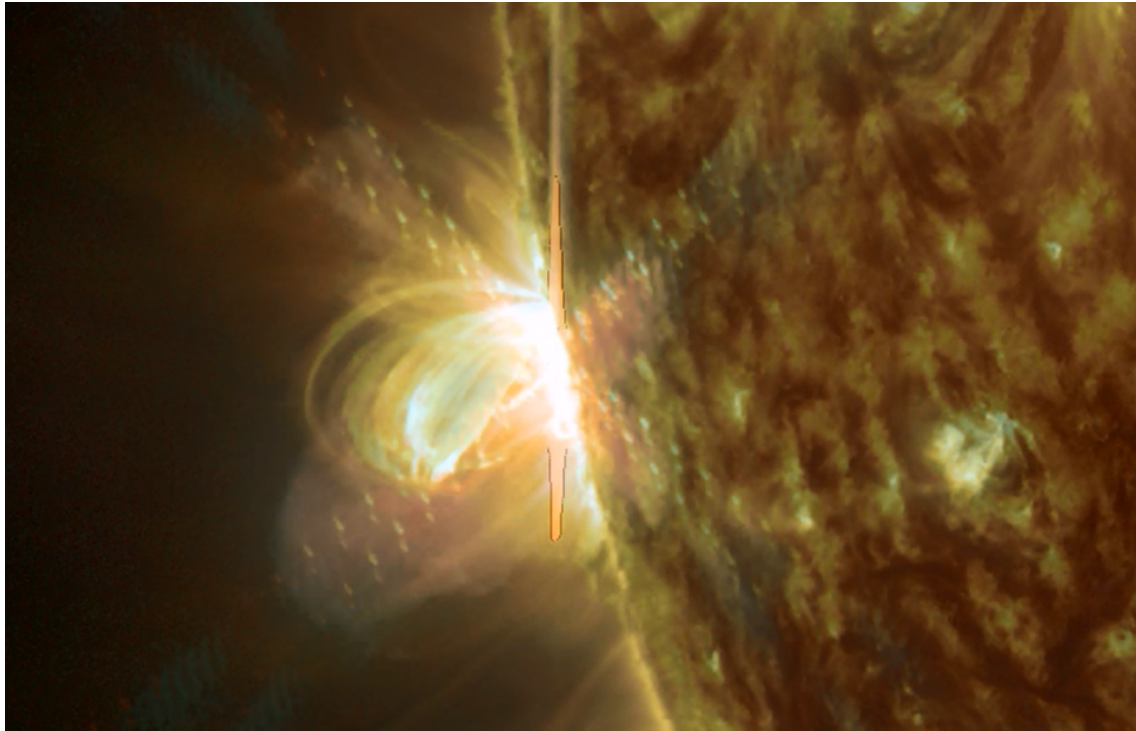
## 1. M9-flare rattles the solar corona (15 Oct 2012 - 21 Oct 2012)

On 20 October, the Sun unleashed an impulsive M9-flare. This flare peaked at 18:14UT in sunspot group NOAA 1598, which was at the time of the blast still partially behind the southeastern solar limb. One already has to go back to 12 July to find an even stronger flare (X1.4 in NOAA 1520).

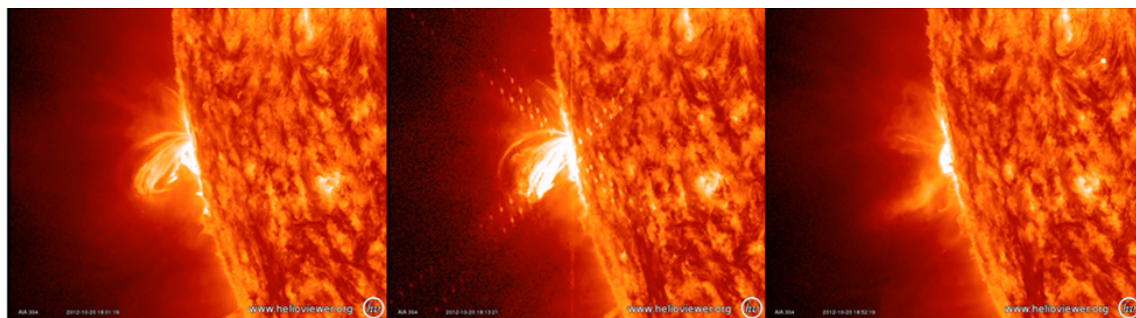
The flare did not last long: Starting at 18:05UT, it already had come to its end by 18:19UT. No high-energetic protons were released at the time of the flare, and only a slow and weak coronal mass ejection (CME), directed away from Earth, was associated with it.



The SDO-images (<http://sdo.gsfc.nasa.gov/>) provided a quite spectacular view of this flaring active region. A movie ([http://www.youtube.com/watch?v=74\\_JiCN6VO0](http://www.youtube.com/watch?v=74_JiCN6VO0)) was created starting with some white light images of NOAA 1598's main spot as it rotated onto the disk. Then follow 4 clips imaging the eruption in successively higher temperatures: 50.000° (AIA 304), 650.000° (AIA 171), 2 million degrees (AIA 211) and 2.5 million degrees (AIA 335). The movie ends with a combo-clip combining imagery from AIA 304, 171 and 131 providing a good view of the event throughout the entire temperature range of the transition region and corona. Each clip covers the time frame from 17:00-23:00UT.



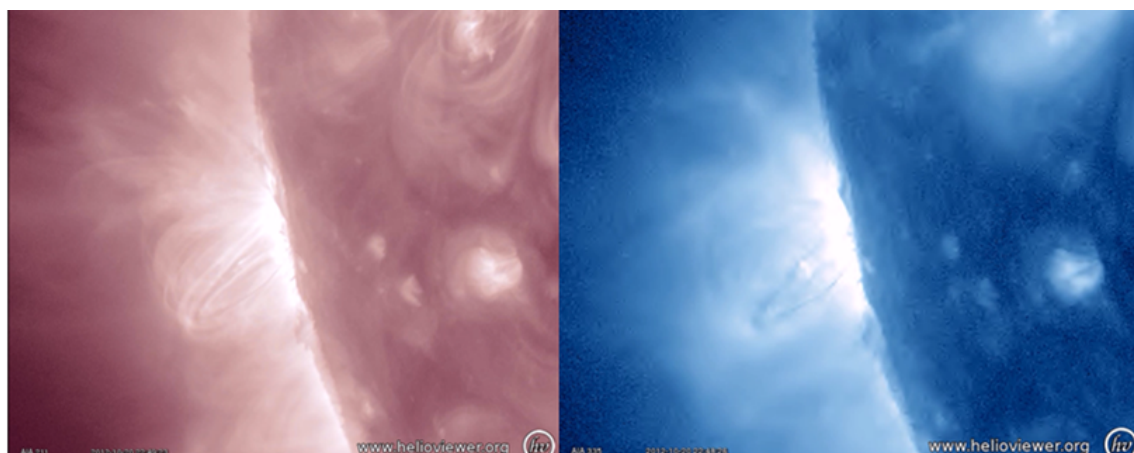
Interesting to see is the appearance, oscillation and disappearance of bright coronal loops inside this active region just prior and during the M9-flare. The appearance of these loops is measured in GOES x-ray data as a C2.4-flare peaking at 17:37UT. Other loops to the north of the active region, already visible before the M9-flare, are also oscillating. In response to the M9-flare, these loops can then be seen oscillating as if they were quivering jelly. Similar to the waves from earthquakes being used as an indirect way to probe the Earth's interior, these oscillations of coronal loops are used to indirectly estimate properties of the Sun's hot atmosphere (e.g. magnetic field,...). This domain of study is called coronal seismology.



Around 19:30UT, the first post-flare coronal loops of the M9-flare can be seen forming a bit to the south of the blast site. During the subsequent hours, they evolve into a fascinating series of ever growing loops.



The higher temperature images (especially AIA 335) do not show the individual coronal loops very well, but quite visible is the formation of dark material. The darkness of this material is an indication that its temperature is substantially less than 2.5 million degrees.



## 2. Review of solar activity (15 Oct 2012 - 21 Oct 2012)

Solar activity has been eruptive featuring 30 C flares throughout the week, and rose to active conditions on October 20, when NOAA AR 11598 produced an M9.1 flare peaking at 18:14 UT. No Earthward CMEs were released.

## 3. Review of geomagnetic activity (15 Oct 2012 - 21 Oct 2012)

The week started with a minor geomagnetic storm on October 15, and the geomagnetic field was at quiet levels for the rest of the week.

## 4. Noticeable Solar Events (15 Oct 2012 - 21 Oct 2012)

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA	NOTE
20	1805	1814	1819		M9.0		0	II/1		1598	
21	1946	2003	2020	S10E76	M1.3	SF	0		2	1598	associated CME

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. PROBA2 Observations (15 Oct 2012 - 21 Oct 2012)

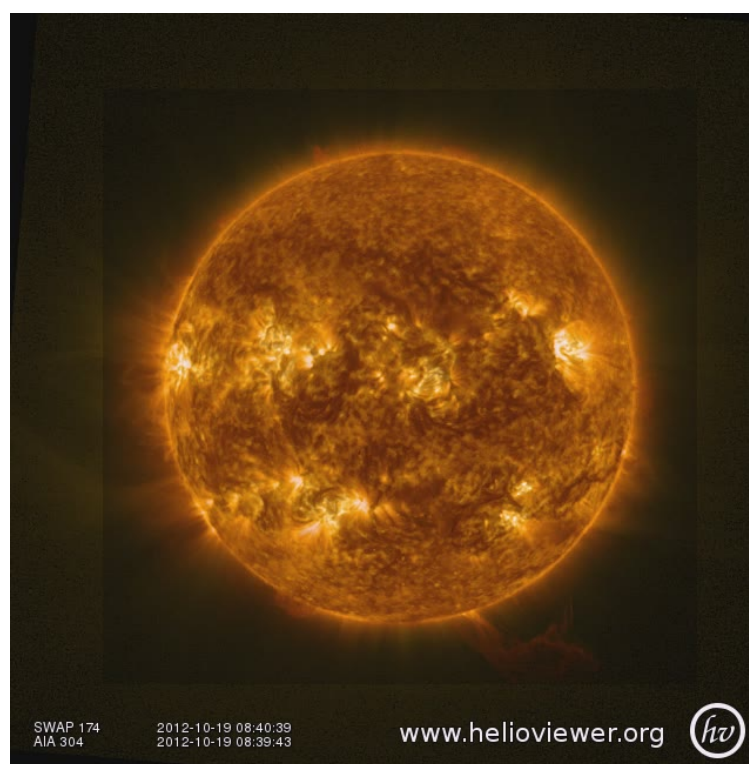
### Solar Activity

This week, the Sun's activity level was \*Low\* until the week end. On Saturday and Sunday, a new active region (AR11598) started to appear on the East limb and generated an M9.0 and M1.3 respectively (\*Moderate\* activity).

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.

### October 19th

On October 19th, a rather spectacular prominence eruption occurred on the south limb (see images below). First image is a SWAP (174)/AIA (304) combination, generated with HelioViewer. Second image is a SWAP difference image.





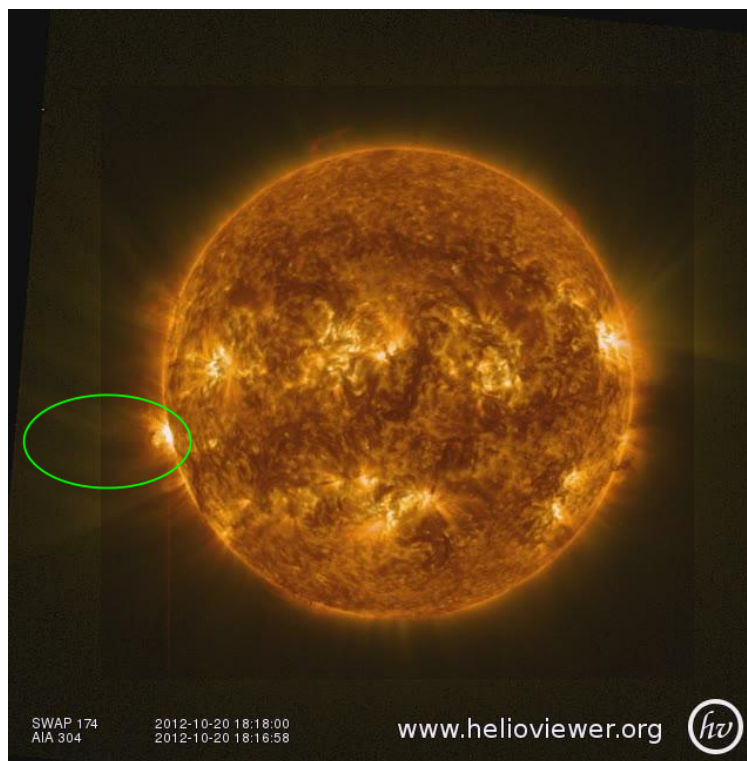


Also, along the east limb, quite some activity can be observed from an active region behind the limb.

These events can be seen unfolding here: [http://proba2.oma.be/swap/data/mpg/movies/campaign\\_movies/2012\\_10\\_19\\_00\\_00\\_07\\_2012\\_10\\_19\\_23\\_50\\_31\\_SWAP\\_174\\_\\_AIA\\_304.mp4](http://proba2.oma.be/swap/data/mpg/movies/campaign_movies/2012_10_19_00_00_07_2012_10_19_23_50_31_SWAP_174__AIA_304.mp4) (SWAP/AIA movie; HelioViewer) and [http://proba2.oma.be/swap/data/mpg/movies/campaign\\_movies/20121019\\_swap\\_diff\\_SouthLimbEruption.mp4](http://proba2.oma.be/swap/data/mpg/movies/campaign_movies/20121019_swap_diff_SouthLimbEruption.mp4) (SWAP difference movie).

#### October 20th

On October 20th, the aforementioned active region approached the east limb, thereby better disclosing the intensity of its activity. Even though the AR did not yet round the east limb, it displayed M9.0 flare activity during the evening (see pictures below). First image is a SWAP (174)/AIA (304) combination generated with HelioViewer. Second image is a SWAP difference image.



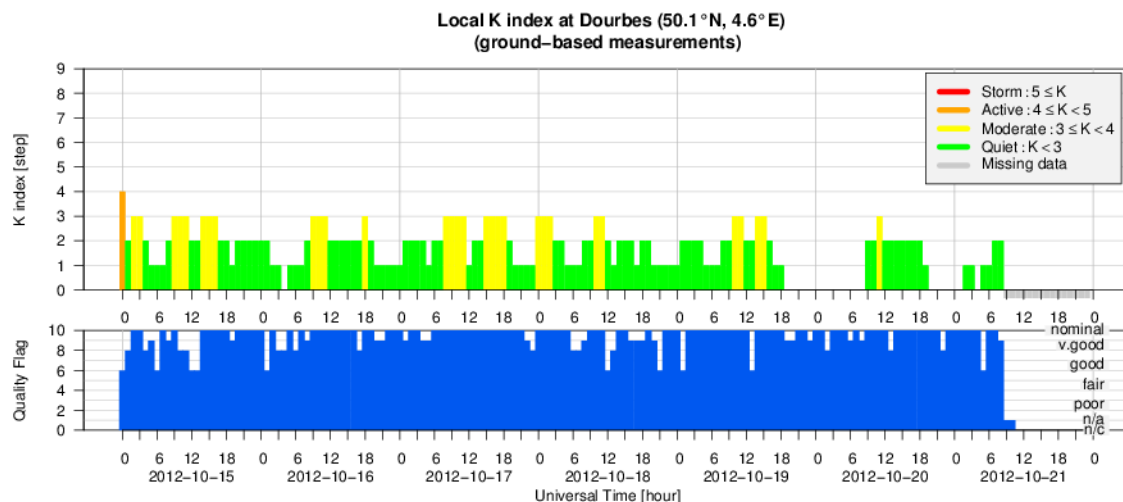
Movies of this event can be seen here: [http://proba2.oma.be/swap/data/mpg/movies/campaign\\_movies/2012\\_10\\_20\\_16\\_00\\_07\\_2012\\_10\\_20\\_21\\_58\\_19\\_SWAP\\_174\\_\\_AIA\\_304.mp4](http://proba2.oma.be/swap/data/mpg/movies/campaign_movies/2012_10_20_16_00_07_2012_10_20_21_58_19_SWAP_174__AIA_304.mp4)

(SWAP/AIA movie; HelioViewer) and here: [http://proba2.oma.be/swap/data/mpg/movies/campaign\\_movies/20121020\\_M90\\_swap\\_diff.mp4](http://proba2.oma.be/swap/data/mpg/movies/campaign_movies/20121020_M90_swap_diff.mp4) (SWAP difference movie).

October 21st

On Sunday, the same active region also generated a (not so visible) M1.3 flare.

## 6. Geomagnetic Observations at Dourbes (15 Oct 2012 - 21 Oct 2012)



## 7. Future Events

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

### Solar ALMA workshop in Glasgow (UK)

Start : 2013-01-14 - End : 2013-01-17

The Atacama Large Millimeter/submillimeter Array (ALMA), an international partnership of Europe, North America and East Asia in cooperation with the Republic of Chile, is the largest astronomical project in existence.

The workshop aims to bring together the ALMA-minded solar community to discuss solar observational issues with ALMA, solar science and planned observations with ALMA, and the planning of solar ALMA observations.

The workshop is hosted by Astronomy & Astrophysics Group, and will take place in School of Physics and Astronomy, University of Glasgow, Room 323, Kelvin Building.

Website:

<http://www.astro.gla.ac.uk/~eduard/solarALMA/>

### Understanding the Dynamics of the Sun using Helioseismology and MHD Simulations in NASA Ames Research Center, CA (USA)

Start : 2013-02-04 - End : 2013-02-08

Helioseismology provides tools for imaging structures and mass flows below the solar surface, and is becoming an essential technique for understanding the dynamics of solar activities and developing physics-based forecasts of the solar cycle, emerging active regions and energy release events. A better understanding is needed to unravel the effects of the complex interactions of solar oscillations with the turbulent magnetized plasma on global and local helioseismology diagnostics. These effects are



particularly challenging in regions of strong magnetic fields. Numerical simulations of solar MHD waves and turbulent dynamics give important insights into the complicated wave and turbulence physics, and provide synthetic data for verification and validation of helioseismology methods and results.

The goals of this workshop are to discuss and stimulate further development of helioseismology methods, solar interior models, and realistic numerical simulations. These goals are particularly important for analysis of the continuous data flow from the Solar Dynamics Observatory, development and verification of helioseismology methods, and for theoretical interpretation of observations and inversion results.

Website:

<http://sun.stanford.edu/LWS2013/>

### **Causes and Consequences of the Extended Solar Minimum Between Solar Cycles 23 and 24 (4CESM) in Key Largo, FL (USA)**

Start : 2013-04-08 - End : 2013-04-12

The most recent solar minimum, solar cycle 23-24 minimum, was unusually long (266 spotless days in 2008, the most since 1913), and the magnetic field at the solar poles was approximately 40% weaker than the last cycle; and unusually complex (the solar wind was characterized by a warped heliospheric current sheet, HCS, and fast-wind streams at low latitudes: the fast-wind threads the ecliptic more commonly in 2008 than 1996.) This complexity resulted in many effects observed from Sun to Earth, with many observations indicating unusual conditions on the Sun, in the heliosphere, and in the magnetosphere, ionosphere, and upper atmosphere of the Earth.

This remarkable set of conditions provide the scientific community with an exceptional opportunity to assess the nature and structure of a very quiet Sun, and an upper atmosphere relatively devoid of solar influences, helping to provide a better understanding of the relative roles of solar activity and internal variability in the dynamics of the Earth's upper atmosphere and ionosphere. Such an understanding requires a multidisciplinary approach.

The main goal of the conference is to bring together the solar, heliospheric, magnetospheric, upper atmosphere, and ionospheric communities to debate and discuss interdisciplinary work and reach a better understanding of the nature and structure of a very quiet Sun, and of an upper atmosphere relatively devoid of solar influences, and in doing so, to help clarify the role of solar activity in the dynamics and variability of the Earth's upper atmosphere and ionosphere relative to the internal variations.

Website:

<http://chapman.agu.org/solarminimum/>

### **NSO Workshop #27: 50 Years of the Seismology of the Sun and Stars in Sunspot, NM (USA)**

Start : 2013-05-06 - End : 2013-05-10

In the last 50 years, helioseismology has made significant contributions to the knowledge of the Sun's interior physics and has led the way to asteroseismology. We have now reached an era where more sophisticated questions are being asked to understand the subtle properties of the Sun and other stars due to the synoptic and high-resolution observations available from BISON, GONG and space missions such as SOHO, SDO, CoRoT and Kepler.

On this occasion, a workshop on the theme of '50 years of the seismology of the Sun and stars' is being organized to reflect the progress that has been made as well as to focus on future goals. We plan to bring together helio- and asteroseismologists, theorists and observers in a journey that will take us from the interior of the Sun and its magnetism towards the structure of distant stars and activity cycles.

Website:

<http://www.nso.edu/workshops/2013>

### **Space weather summer school in Alpbach, Austria**

Start : 2013-07-16 - End : 2013-07-25

The Summer School Alpbach enjoys 36 years of tradition in providing in-depth teaching on different topics of space science & technology, featuring lectures and concentrated working sessions on mission studies in self-organised working groups. 60 young highly qualified European science and engineering

students converge annually for stimulating 10 days of work in the Austrian Alps. 4 teams compete to design a space mission judged by a jury of experts. Students learn how to approach the design of a satellite mission and explore new and startling ideas supported by experts. The Summer School 2013 will focus on Space Weather .

The purpose of the Summer School is to foster the practical application of knowledge derived from lectures, to develop organisational and team-work skills and to encourage creativity. Teams will compete to design the best project, judged by an independent jury. The teams themselves are responsible for the selection of the subject of the project and for the team structure and working methods.

Website:

<http://www.summerschoolalpbach.at/>

## **7th International Workshop on Solar Polarization in Kunming, China**

Start : 2013-09-09 - End : 2013-09-14

We gain information about the universe through analysis of the spectra from celestial objects. However, while the intensity spectrum represents a scalar quantity but electromagnetic radiation occurs in the form of transverse waves, the polarized spectrum provides us with a 4-vector, the Stokes vector. The increased amount of information space opens new windows to the universe, in particular for the exploration of magnetic fields. It is well recognized that the magnetic field is a primary agent responsible for structuring and the source of all variability on intermediate time scales, which manifests itself in all forms of solar and stellar activity.

It is therefore not surprising that every year there are many scientific meetings organized with the objective of studying the role of magnetic fields in cosmic objects. What is largely missing in these meetings is however an in-depth investigation of the fundamental aspects of how magnetic fields can be determined by the means of spectro-polarimetry, our main gateway to cosmic magnetism. The primary aim of our series of Workshops is to address these fundamental aspects, with less emphasis on the morphological and physical properties of cosmic magnetic fields.

Website: <http://spw7.ynao.ac.cn/>

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

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

### **eHEROES - Solar Cycle 24, zonnecyclus in het vizier**

Presentatie over de 24ste zonnecyclus voor leden van de volkssterrenwacht Urania in het kader van hun wekelijkse voordrachten. Een basiskennis is vereist.

<http://www.spaceweather.eu/en/repository/show?id=254>

### **eHEROES - de Zon**

Presentatie over de zon voor leden van de volkssterrenwacht MIRA in het kader van een cursus sterrenkunde. Een basiskennis is vereist.

<http://www.spaceweather.eu/en/repository/show?id=255>

### **Solar Orbiter 5 Workshop - Session 1: Solar Magnetic Field Reversal and the Role of the Dynamo Families**

Talk in the session Solar magnetism and the solar cycle

<http://www.spaceweather.eu/en/repository/show?id=256>

### **Solar Orbiter 5 Workshop - Session 1: Planning for Helioseismology with SO/ PHI**

Talk in the session Solar Magnetism and the Solar Cycle

<http://www.spaceweather.eu/en/repository/show?id=257>

## **Solar Orbiter 5 Workshop - Session 1: Small Magnetic Elements, Bright Points and Solar Irradiance**

Talk in the session Solar Magnetism and the Solar Cycle  
<http://www.spaceweather.eu/en/repository/show?id=258>

## **Solar Orbiter 5 Workshop - Session 1: The Solar Cycle as seen in the Heliospheric Magnetic Field**

Talk in the session Solar Magnetism and the Solar Cycle  
<http://www.spaceweather.eu/en/repository/show?id=259>

## **Solar Orbiter 5 Workshop - Session 1: The heliospheric magnetic flux density through several solar cycles**

Talk in the session Solar Magnetism and the Solar Cycle  
<http://www.spaceweather.eu/en/repository/show?id=260>

## **Solar Orbiter 5 Workshop - Session 2 - Part I: Ejection of Cool Plasma into the Corona - Comparison of 1D and 3D Loop Models**

Talk in the session Processes of slow/steady energy release in the solar atmosphere and heliosphere  
<http://www.spaceweather.eu/en/repository/show?id=261>

## **Solar Orbiter 5 Workshop - Session 2 - Part I: Outflow Velocity Structure in the Upper Transition Region and Corona**

Talk in the session Processes of slow/steady energy release in the solar atmosphere and heliosphere  
<http://www.spaceweather.eu/en/repository/show?id=262>

## **Solar Orbiter 5 Workshop - Session 2 - Part I: Interchange Reconnection in a Turbulent Corona**

Talk in the session Processes of slow/steady energy release in the solar atmosphere and heliosphere  
<http://www.spaceweather.eu/en/repository/show?id=263>

## **Solar Orbiter 5 Workshop - Session 2 - Part II: Slow Solar Wind Coronal Sources: Comparison between two Solar Minima (UVCS/SOHO)**

Talk in the session Processes of slow/steady energy release in the solar atmosphere and heliosphere  
<http://www.spaceweather.eu/en/repository/show?id=264>

## **Solar Orbiter 5 Workshop - Session 2 - Part II: The Helium corona as observed by the HERSCHEL Sounding Rocket**

Talk in the session Processes of slow/steady energy release in the solar atmosphere and heliosphere  
<http://www.spaceweather.eu/en/repository/show?id=265>

## **Solar Orbiter 5 Workshop - Session 2 - Part II: Linking in-situ Measurements with SPICE**

Talk in the session Processes of slow/steady energy release in the solar atmosphere and heliosphere  
<http://www.spaceweather.eu/en/repository/show?id=266>

## **Solar Orbiter 5 Workshop - Session 2 - Part II: Understanding the Nature of the Solar Wind in the Solar Orbiter Era**

Invited talk in the session Processes of slow/steady energy release in the solar atmosphere and heliosphere  
<http://www.spaceweather.eu/en/repository/show?id=267>

## **Solar Orbiter 5 Workshop - Session 2 - Part II: Kinetic Processes in the Solar Wind**

Invited talk in the session Processes of slow/steady energy release in the solar atmosphere and heliosphere

<http://www.spaceweather.eu/en/repository/show?id=268>

## **Solar Orbiter 5 Workshop - Session 2 - Part II: SWAP/PROBA2 Observations of the Largescale, Longterm Evolution of the EUV Corona**

Talk in the session Processes of slow/steady energy release in the solar atmosphere and heliosphere

<http://www.spaceweather.eu/en/repository/show?id=269>

## **Solar Orbiter 5 Workshop - Session 3 - Part I: Physics of Solar Flares**

Invited talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=270>

## **Solar Orbiter 5 Workshop - Session 3 - Part I: Direct Imaging and Spectroscopy of Flare Accelerated Electron Beams with STIX**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=271>

## **Solar Orbiter 5 Workshop - Session 3 - Part I: Pre-flare Signatures in Large Flares**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=272>

## **Solar Orbiter 5 Workshop - Session 3 - Part I: Observations of CME's In the Outer Corona**

Invited talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=273>

## **Solar Orbiter 5 Workshop - Session 3 - Part I: Changes in the Photospheric Magnetic Field during CMEs**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=274>

## **Solar Orbiter 5 Workshop - Session 3 - Part II: CMEs: Taking Magnetic Helicity from Low Corona into Interplanetary Space**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=275>

## **Solar Orbiter 5 Workshop - Session 3 - Part II: Observation of a Post-CME Current Sheet with SOHO/UVCS and RHESSI**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=276>

### **Solar Orbiter 5 Workshop - Session 3 - Part II: Magnetic Cloud-erosion by Magnetic reconnection during propagation, geom. imp.**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=277>

### **Solar Orbiter 5 Workshop - Session 3 - Part II: Energetic Particle Acceleration on the Sun and in the Heliosphere**

Invited talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=278>

### **Solar Orbiter 5 Workshop - Session 3 - Part II: Solar Energetic Particle Events and their Parent Activity - Statistical Rel.**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=279>

### **Solar Orbiter 5 Workshop - Session 3 - Part III: Observations of Solar Wind Coherent Structures During SEP Dropouts Events**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=282>

### **Solar Orbiter 5 Workshop - Session 4: Solar Flare Forecasting from Solar Orbiter Observations**

Talk in the session Data assimilation, visualization and analysis

<http://www.spaceweather.eu/en/repository/show?id=283>

### **Solar Orbiter 5 Workshop - Session 4: Modeling the Corona and Solar Wind using Synchronic Maps**

Invited talk in session Data assimilation, visualization and analysis

<http://www.spaceweather.eu/en/repository/show?id=285>

### **Solar Orbiter 5 Workshop - Session 4: Dust detection with radio instruments: RPW experiment onboard Solar Orbiter**

Talk in session Data assimilation, visualization and analysis

<http://www.spaceweather.eu/en/repository/show?id=286>

### **Solar Orbiter 5 Workshop - Session 4: Visualizing the Sun and Heliosphere in 3D**

Talk in session Data assimilation, visualization and analysis

<http://www.spaceweather.eu/en/repository/show?id=287>

### **Solar Orbiter 5 Workshop - Session 4: Pushing Solar Image Compression to its Limit**

Talk in session Data assimilation, visualization and analysis

<http://www.spaceweather.eu/en/repository/show?id=288>

### **Solar Orbiter 5 Workshop - Session 4: Exploring Heterogeneous Solar Data**

Invited talk in session Data assimilation, visualization and analysis



<http://www.spaceweather.eu/en/repository/show?id=289>

### **Solar Orbiter 5 Workshop - Session 1: The Solar Dynamo**

Invited talk given in the Session Solar Magnetism and the solar cycle

<http://www.spaceweather.eu/en/repository/show?id=290>

### **Solar Orbiter 5 Workshop - Session 3 - Part II: Recent Advances in Understanding the Nature of CMEs by Combining Solar Observati**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere.

<http://www.spaceweather.eu/en/repository/show?id=291>

### **Solar Orbiter 5 Workshop - Session 4: Mass Estimates of Rapidly-moving Prominence Material from High-cadence EUV Images**

Talk in session Data assimilation, visualization and analysis

<http://www.spaceweather.eu/en/repository/show?id=292>

### **Solar Orbiter 5 Workshop - Session 2 - Part II: The Slow Solar Wind Structure Revealed by Periodic Analysis of WhiteLight Images**

Talk given in the Session Processes of slow/steady energy release in the solar atmosphere and heliosphere

<http://www.spaceweather.eu/en/repository/show?id=293>

### **Solar Orbiter 5 Workshop - Session 3 - Part I: CME Eruption and Accompanying Phenomena Observed in the Low Corona**

Invited talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=294>

### **Solar Orbiter 5 Workshop - Session 3 - Part II: Evidence for Rayleigh-Taylor plasma instabilities at the front of solar CMEs**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=295>

### **Solar Orbiter 5 Workshop - Session 3 - Part III: Radial Dependence of Solar Energetic Particle Intensities**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=280>

### **eHEROES - Propagation of CMEs in IP Space**

The propagation behavior of coronal mass ejections (CMEs) in interplanetary (IP) space is mainly influenced by the ambient solar wind flow. The interaction of CMEs with the solar wind can be expressed as drag force and manifests itself to decelerate CMEs that are faster than the ambient solar wind, whereas slower ones are accelerated until the CME speed is finally adjusted to the solar wind speed. With the SECCHI instrument suite aboard STEREO, CMEs can be observed during their entire propagation way from Sun to 1AU. The derived kinematical profile and its changes may be interpreted as interaction with high speed solar wind streams as well as other coronal mass ejections.

<http://www.spaceweather.eu/en/repository/show?id=296>

### **eHEROES - CME-CME interaction event February 15, 2011**

<http://www.spaceweather.eu/en/repository/show?id=297>

**Solar Orbiter 5 Workshop - Session 3 - Part III: Influence Interplanetary Shock on Heliocentric Radial Var. of Gradual SEP**

Talk in the session Eruptive processes in the solar atmosphere and their manifestations in the heliosphere

<http://www.spaceweather.eu/en/repository/show?id=281>