STCE Newsletter

8 Oct 2012 - 14 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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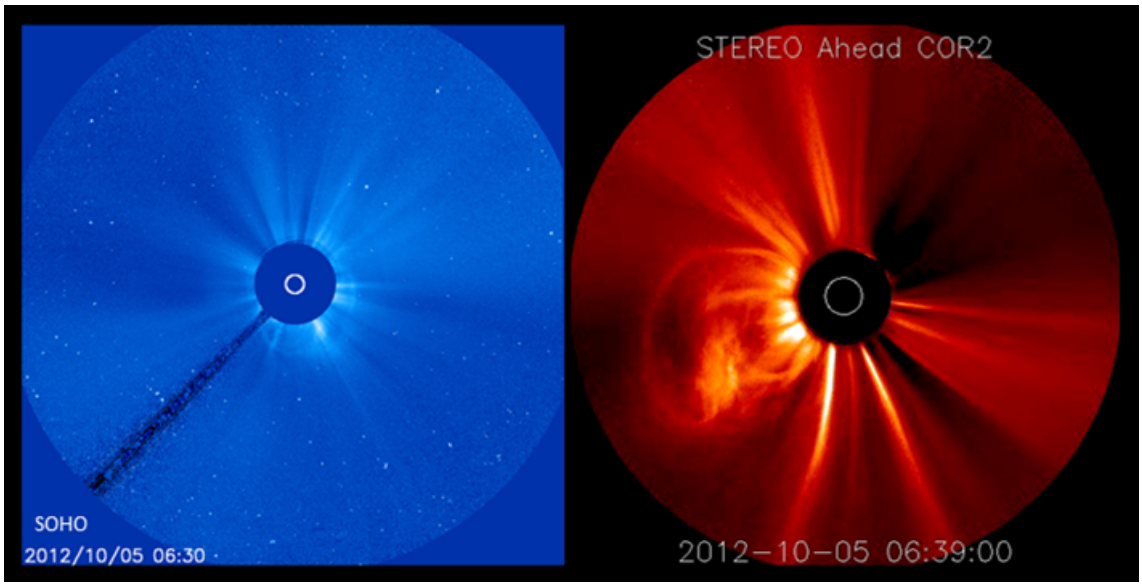
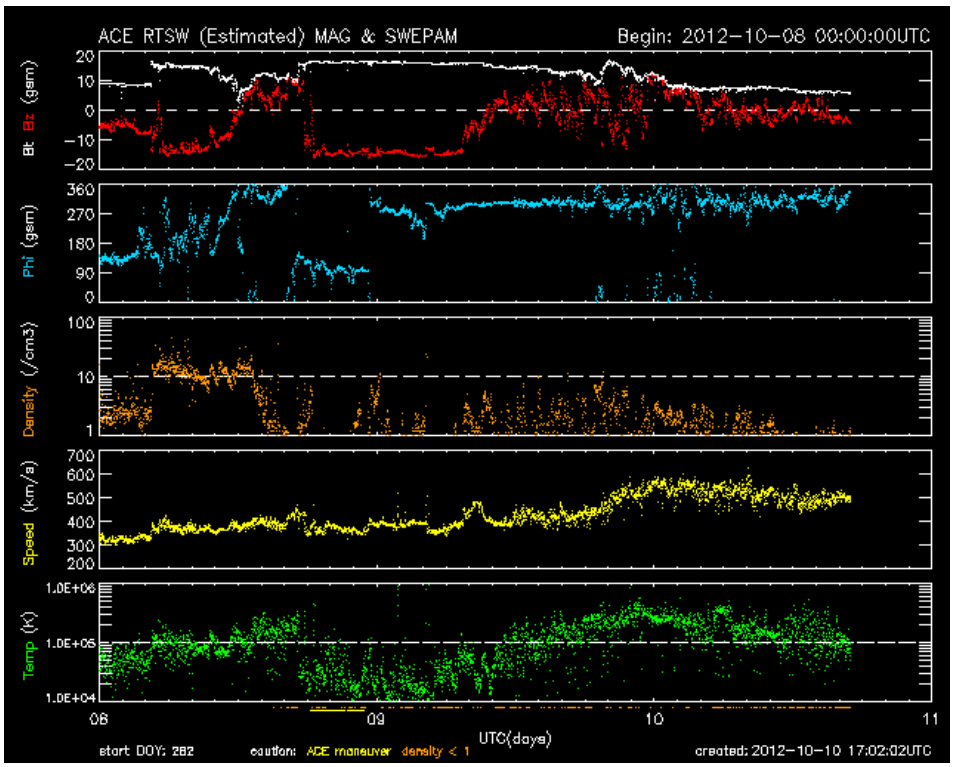
1. Trouble never comes alone (8 Oct 2012 - 14 Oct 2012)

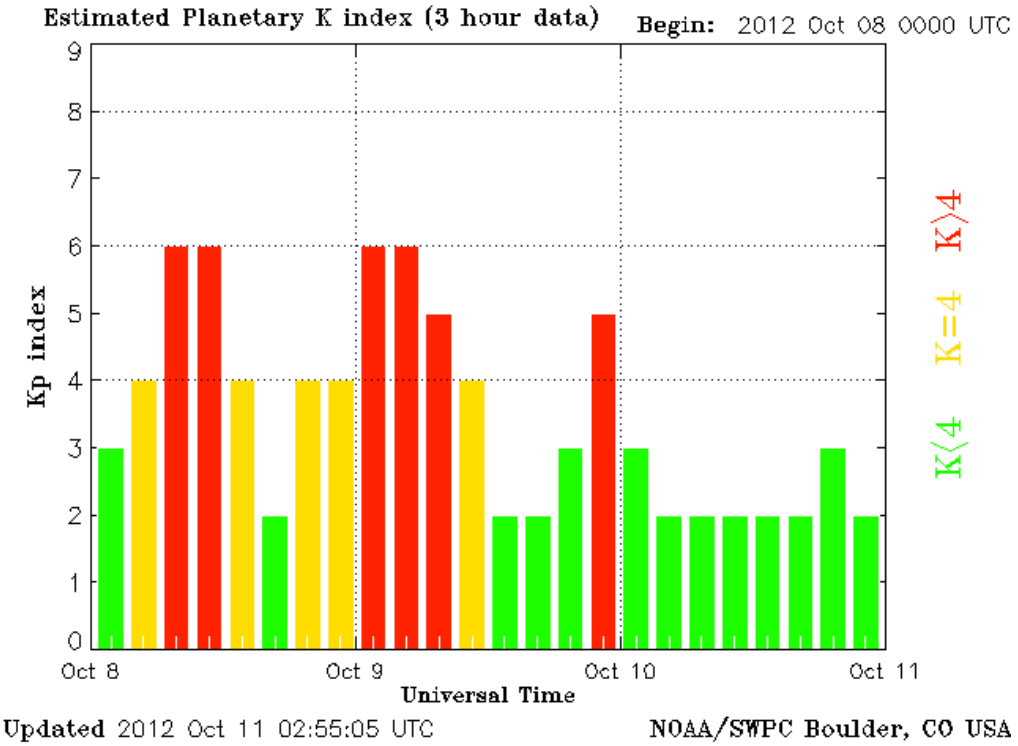
As discussed in the previous STCE Newsletter (http://stce.be/news/163/welcome.html), the very Long Duration Event from 5 October propelled a coronal mass ejection (CME) towards Earth. From the SOHO (http://sohowww.nascom.nasa.gov/) and STEREO (http://stereo.gsfc.nasa.gov/) imagery, forecasters concluded that this CME would deliver a glancing blow late on 8 October or on 9 October.



Surprisingly enough, the CME struck already during the early morning hours of 8 October. It had also a very interesting magnetic signature (Bz - red curve in ACE-graph underneath, indicating whether the orientation of the magnetic field is northward or southward). There is a first period having a southward orientation from 4 o'clock till noon, then follows a north-oriented period from noon till 18:00UT, concluded by another southward episode till 7 o'clock on 9 October. After that, the (expected) influence of a coronal hole (CH) can be seen in the slow increase of wind speed (yellow curve) and the (much) higher temperatures (green curve).

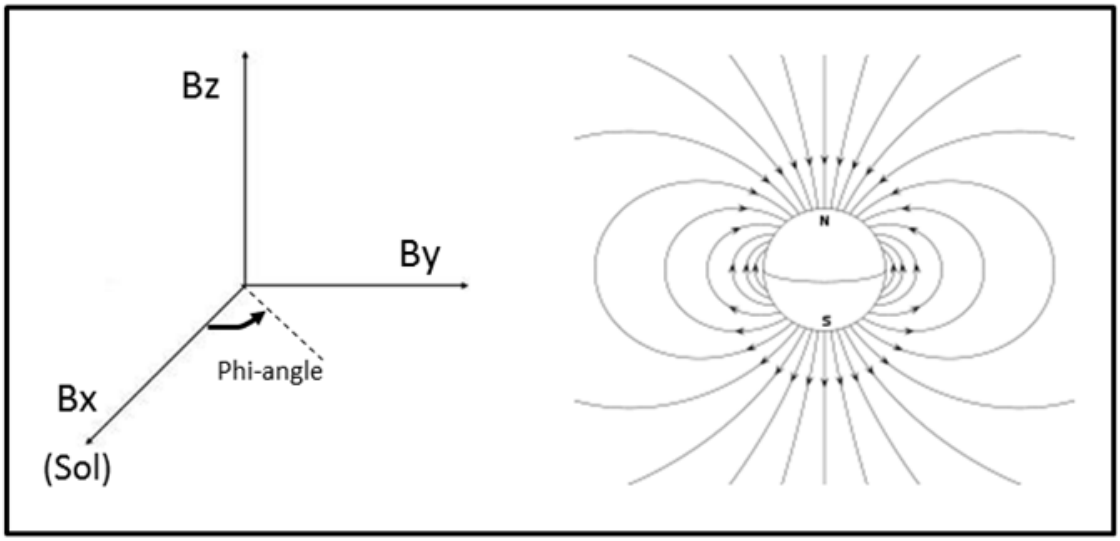


Because of the southward direction of the magnetic field, the geomagnetic field experienced moderate storming levels three times: During the morning hours of 8 October, again early on 9 October, and finally late 9 October under the influence of the CH. Thus, the question how *one* CME could produce *two* storm periods begs for an answer.



ACE (http://www.srl.caltech.edu/ACE/), the spacecraft that is measuring the solar wind, is located well outside the geomagnetic field. As it recorded these separate periods in the solar wind en route to Earth, the geomagnetic storms had to be a consequence of true changes in the solar wind.

An additional examination of STEREO and SOHO-images by Space Weather forecasters at the STCE revealed there was no other CME involved. But why was this one so early? Scrutiny of the ACE-data indicated there is no doubt that the second period with negative Bz-values is the true CME. That one arrived around 18:00UT, well within the uncertainty limits of the prediction. Forecasters can tell this is the CME because of the low temperature of the particles (i.e. a lot lower than that of the subsequent CH).



The first period with negative Bz-values and the short period with positive Bz-values seem to be embedded in the solar wind. This is not part of the CME, but concerns particles swept up by the shock wave driven by the arriving CME (for another example, see also the 14 July Newsletter: http://stce.be/news/150/welcome.html). This conclusion is based on the temperature of the particles, which is a lot higher than that inside the CME, as well as on the very erratic behavior of the orientation of the magnetic field in the ecliptic plane (so-called Phi-angle: the blue curve in the ACE-data) during that time frame. The slow solar wind, and the Earth passing through the flank of the CME, may thus explain this lengthy and unusual prologue to the true CME.

2. Review of solar activity (8 Oct 2012 - 14 Oct 2012)

Solar activity was moderate during the week, with 3 M-class flares which occurred in two active regions just behind or at the East limb at the time of the events. The strongest event was an M2.3 flare, on Oct 8, 11.17 UT (peak time), which took place in what became NOAA AR 1589 on Oct 10.

3. Review of geomagnetic activity (8 Oct 2012 - 14 Oct 2012)

Geomagnetic activity was dominated by a period of minor to moderate storm conditions from Oct 8 till Oct 9 at planetary levels. Minor storm conditions (K=5) were observed locally (Dourbes) on Oct 8. This episode was linked to the arrival of a CME, which was observed on Oct. 5. The in-situ measurements showed a rather complex signature of a magnetic cloud, with a 14 hours delay between the first hint of a shock and the cloud itself.
A second period of minor storm conditions was observed from Oct 13 to Oct 14, both at planetary and at local levels (Dourbes). This episode was due to a high speed solar wind stream linked to a small coronal hole.

4. Noticeable Solar Events (8 Oct 2012 - 14 Oct 2012)

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA	NOTE
8	1105	1117	1123		M2.3		0				Partially occulted flare, behind the east limb
9	2322	2331	2335	S29E86	M1.7		0				Active region at the east limb, not yet numbered
10	0451	0504	0520	S29E86	M1.0		0				

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 (8 Oct 2012 - 14 Oct 2012)

Solar Activity

After last week's low level of activity, the Sun started off with a *Moderate* level activity this week. Two active regions (one north - AR 11589, one south - AR 11590) started being visible on the east limb - and generated one M-flare a day until Wednesday. After that, solar activity went down to *Low*, with a C9.0 flare on Friday.

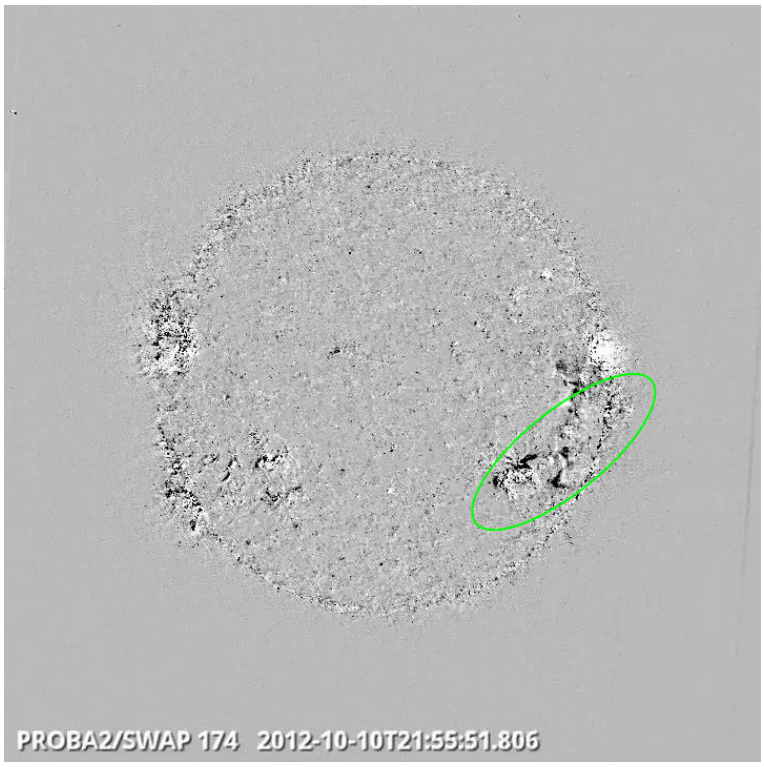
In order to view the activity of this week in more detail, we suggest to go to the following website from which all the daily (normal and difference) movies can be accessed: http://proba2.oma.be/ssa.
This page also lists the recorded flaring events.

Below are presented some of the events that occurred this week.

October 8th
Several eruptions occurred on the east limb during the day, 1 north and 3 (from the same region) south of the solar equator. One event is shown hereunder (SWAP difference image).

October 10th
Several eruptions occurred during the second half of the day, all originating from AR 11585 in the south west quadrant; A SWAP difference movie covering all three events can be seen here: http://proba2.oma.be/swap/data/mpg/movies/campaign_movies/2012_10_10_3eruptions_SWquadrant_AR11585.mp4.

One of the events is shown below (SWAP difference image)

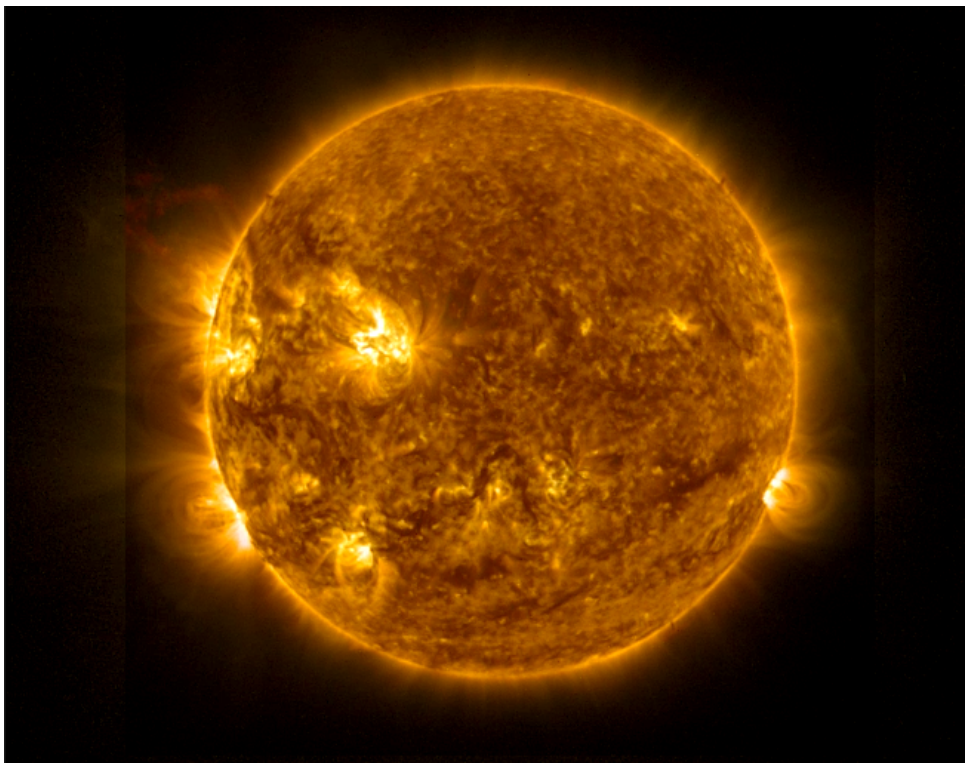


October 12th
A bulb-like eruption occurred on the north-west limb, at 06:05 UT. A HelioViewer SWAP/AIA movie can be seen here: http://proba2.oma.be/swap/data/mpg/movies/campaign_movies/2012_10_12_eruption_Wlimb.mp4.

Below is shown a SWAP difference image of the event.

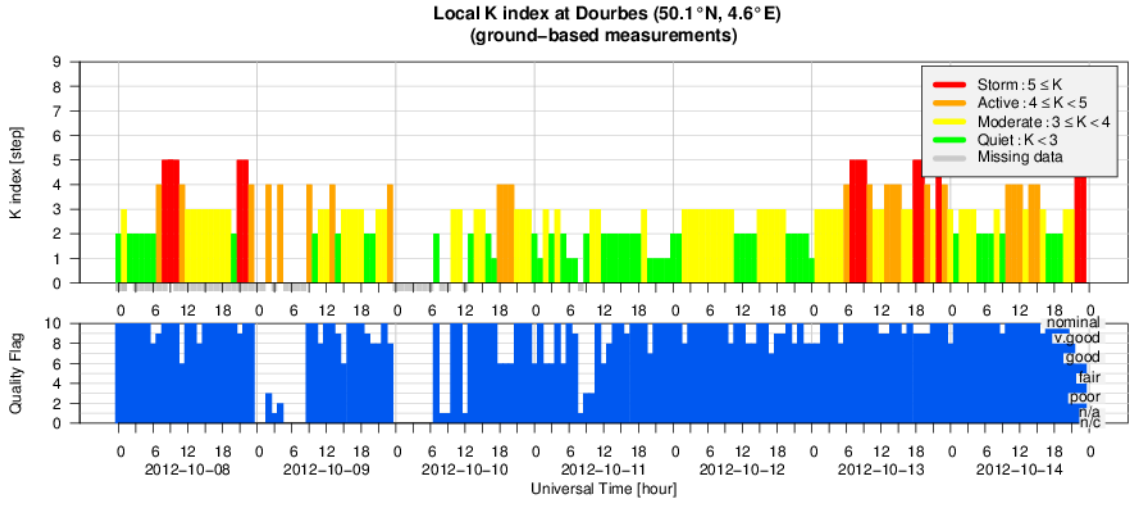
October 14th
Two eruptions occurred consecutively on (or from behind) the north east limb (upper left in image below). The first eruption was quite spectacular. The second one followed rather rapidly a bit more southward and was of a bulb-like nature.

Note, in the image below, the SWAP field of view (yellow) extends further with respect to the AIA 304 FoV (orange).



A HelioViewer SWAP/AIA movie of these events can be seen here: http://proba2.oma.be/swap/data/mpg/movies/campaign_movies/2012_10_13_21_30_19_2012_10_14_03_28_31_SWAP_174__AIA_304-hq.mp4.

6. Geomagnetic Observations at Dourbes (8 Oct 2012 - 14 Oct 2012)



7. New documents in the European Space Weather Portal Repository

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

Solar Orbiter 5 Workshop - Session 1: Review on Helioseismology and Helioseismology with Solar Orbiter

Invited talk in the session Solar Magnetism and the Solar Cycle.
http://www.spaceweather.eu/en/repository/show?id=253

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 Heliocentrical 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

8. 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.
Th 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/

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