

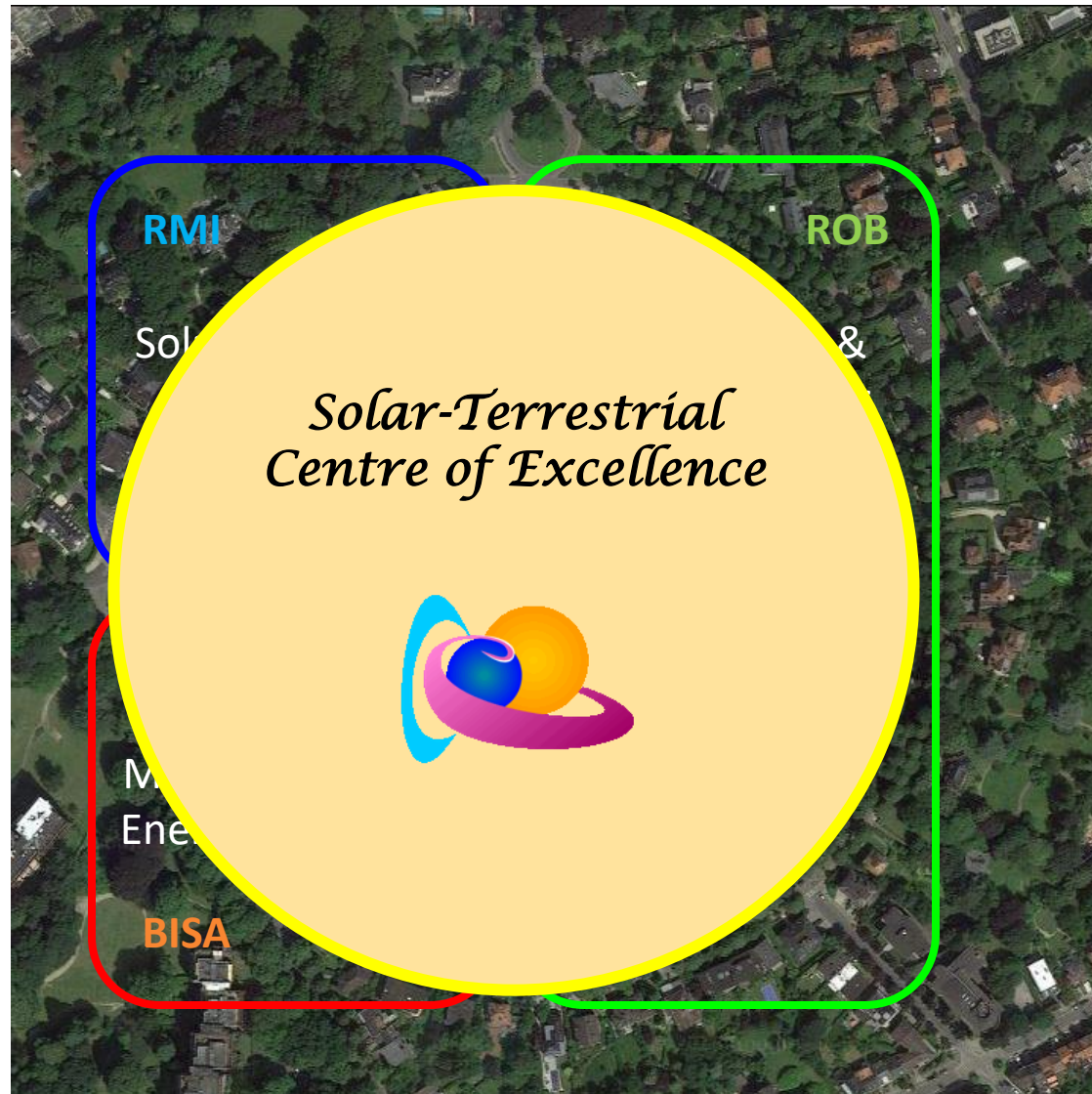
The SIDC - An introduction

Jan Janssens

19 April 2018



The « Space Pole » in Uccle



The SIDC - History

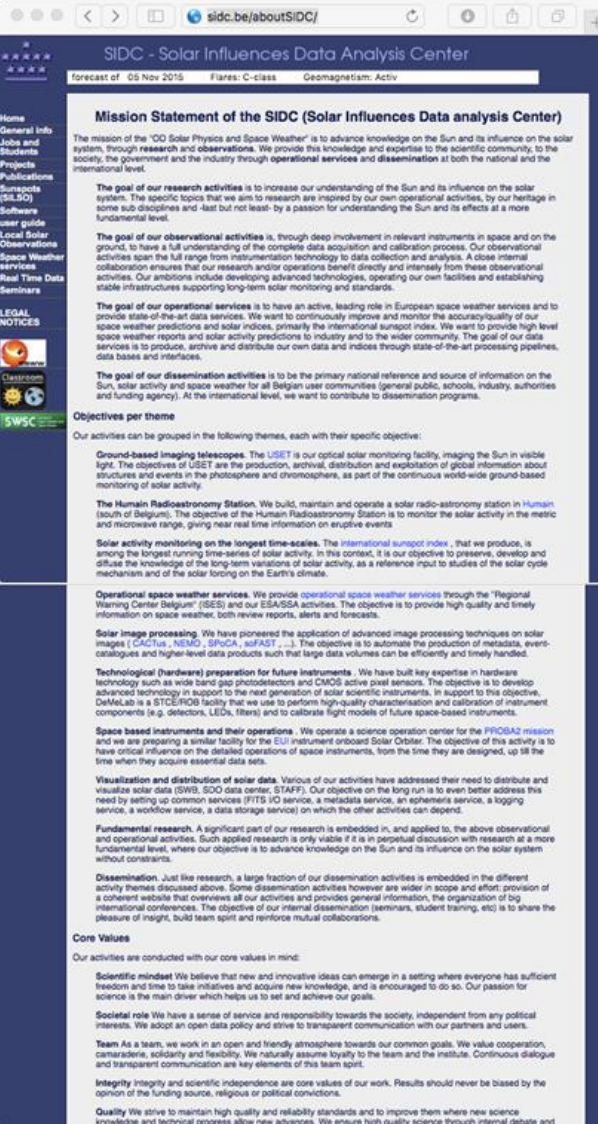
- 1981
 - Sunspot Index Data Centre
 - Sunspot number
- 2000
 - Solar Indices Data analysis Centre
 - = OD «Solar Physics & Space weather»
 - Incl. Space weather services
 - **SIDC/RWC**
- 2013
 - SILSO
 - Sunspot Index and Long-term Solar Observations



The SIDC - Mission Statement

- **Research**: to increase our understanding of the Sun and its influence on the solar system.
- **Observations**: to have a full understanding of the complete data acquisition and calibration process.
- **Services**: to have an active, leading role in European space weather services

<http://sidc.be/aboutSIDC>



The screenshot shows the SIDC website's mission statement page. The page title is "SIDC - Solar Influences Data Analysis Center". The main heading is "Mission Statement of the SIDC (Solar Influences Data Analysis Center)". The text describes the center's mission to advance knowledge of the Sun and its influence on the solar system, through research and observations. It outlines the goals of its research, observational, operational, and dissemination activities. The page also lists objectives per theme, such as ground-based imaging telescopes, the Human Radioastronomy Station, solar activity monitoring, operational space weather services, solar image processing, technological preparation for future instruments, space based instruments and their operations, visualization and distribution of solar data, fundamental research, dissemination, and core values.

Mission Statement of the SIDC (Solar Influences Data Analysis Center)

The mission of the "IOD Solar Physics and Space Weather" is to advance knowledge on the Sun and its influence on the solar system, through research and observations. We provide this knowledge and expertise to the scientific community, to the society, the government and the industry through operational services and dissemination at both the national and the international level.

The goal of our research activities is to increase our understanding of the Sun and its influence on the solar system. The specific topics that we aim to research are inspired by our own operational activities, by our heritage in some sub-disciplines and last but not least by a passion for understanding the Sun and its effects at a more fundamental level.

The goal of our observational activities is, through deep involvement in relevant instruments in space and on the ground, to have a full understanding of the complete data acquisition and calibration process. Our observational activities span the full range from instrumentation technology to data collection and analysis. A close internal collaboration ensures that our research and/or operations benefit directly and intensely from these observational activities. Our ambitions include developing advanced technologies, operating our own facilities and establishing stable infrastructures supporting long-term solar monitoring and standards.

The goal of our operational services is to have an active, leading role in European space weather services and to provide state-of-the-art data services. We want to continuously improve and monitor the accuracy/quality of our space weather predictions and solar indices, primarily the international sunspot index. We want to provide high level space weather reports and solar activity predictions to industry and to the wider community. The goal of our data services is to produce, archive and distribute our own data and indices through state-of-the-art processing pipelines, data bases and interfaces.

The goal of our dissemination activities is to be the primary national reference and source of information on the Sun, solar activity and space weather for all Belgian user communities (general public, schools, industry, authorities and funding agency). At the international level, we want to contribute to dissemination programs.

Objectives per theme

Our activities can be grouped in the following themes, each with their specific objective:

Ground-based imaging telescopes. The USST is our optical solar monitoring facility, imaging the Sun in visible light. The objectives of USST are the production, archival, distribution and exploitation of global information about structures and events in the photosphere and chromosphere, as part of the continuous world-wide ground-based monitoring of solar activity.

The Human Radioastronomy Station. We build, maintain and operate a solar radio-astronomy station in Human (south of Belgium). The objective of the Human Radioastronomy Station is to monitor the solar activity in the mid and microwave range, giving real time information on eruptive events.

Solar activity monitoring on the longest time-scales. The international sunspot index, that we produce, is among the longest running time-series of solar activity. In this context, it is our objective to preserve, develop and diffuse the knowledge of the long-term variations of solar activity, as a reference input to studies of the solar cycle mechanism and of the solar forcing on the Earth's climate.

Operational space weather services. We provide operational space weather services through the "Regional Warning Center Belgium" (RES) and our ESA/ESA activities. The objective is to provide high quality and timely information on space weather, both review reports, alerts and forecasts.

Solar image processing. We have pioneered the application of advanced image processing techniques on solar images (CACTUS, NEMO, SPOCA, soFAST, ...). The objective is to automate the production of metadata, event-catalogues and higher-level data products such that large data volumes can be efficiently and timely handled.

Technological (hardware) preparation for future instruments. We have built key expertise in hardware technology such as wide band gap photodiodes and CMOS active pixel sensors. The objective is to develop advanced technology in support to the next generation of solar scientific instruments, in support to this objective, DeltaLab is a STEREO facility that we use to perform high-quality characterisation and calibration of instrument components (e.g. detectors, LEDs, filters) and to calibrate flight models of future space-based instruments.

Space based instruments and their operations. We operate a science operation center for the PROBA2 mission and we are preparing a similar facility for the EU1 instrument onboard Solar Orbiter. The objective of this activity is to have critical influence on the detailed operations of space instruments, from the time they are designed, up till the time when they acquire essential data sets.

Visualization and distribution of solar data. Various of our activities have addressed their need to distribute and visualize solar data (SWIS, SOO data center, STAFF). Our objective on the long run is to even better address this need by setting up common services (PITS-VD service, a metadata service, an ephemeris service, a logging service, a workflow service, a data storage service) on which the other activities can depend.

Fundamental research. A significant part of our research is embedded in, and applied to, the above observational and operational activities. Such applied research is only viable if it is perpetual discussion with research at a more fundamental level, where our objective is to advance knowledge on the Sun and its influence on the solar system without constraints.

Dissemination. Just like research, a large fraction of our dissemination activities is embedded in the different activity themes discussed above. Some dissemination activities however are wider in scope and effort: provision of a coherent website that overviews all our activities and provides general information, the organization of big international conferences. The objective of our internal dissemination (seminars, student training, etc) is to share the pleasure of insight, build team spirit and reinforce mutual collaborations.

Core Values

Our activities are conducted with our core values in mind:

Scientific mindset We believe that new and innovative ideas can emerge in a setting where everyone has sufficient freedom and time to take initiatives and acquire new knowledge, and is encouraged to do so. Our passion for science is the main driver which helps us to set and achieve our goals.

Societal role We have a sense of service and responsibility towards the society, independent from any political interests. We adopt an open data policy and strive to transparent communication with our partners and users.

Team As a team, we work in an open and friendly atmosphere towards our common goals. We value cooperation, camaraderie, solidarity and flexibility. We naturally assume loyalty to the team and the institute. Continuous dialogue and transparent communication are key elements of this team spirit.

Integrity Integrity and scientific independence are core values of our work. Results should never be biased by the opinion of the funding source, religious or political convictions.

Quality We strive to maintain high quality and reliability standards and to improve them where new science knowledge and technical progress allow new advances. We ensure high quality science through internal debate and

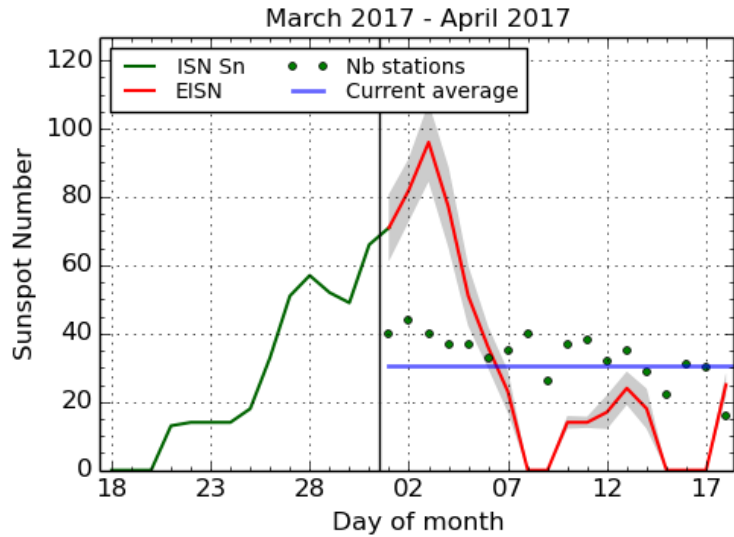
SILSO

- 1981
 - Sunspot Index Data Centre
 - Sunspot number
- 2013
 - SILSO
 - Sunspot Index and Long-term Solar Observations

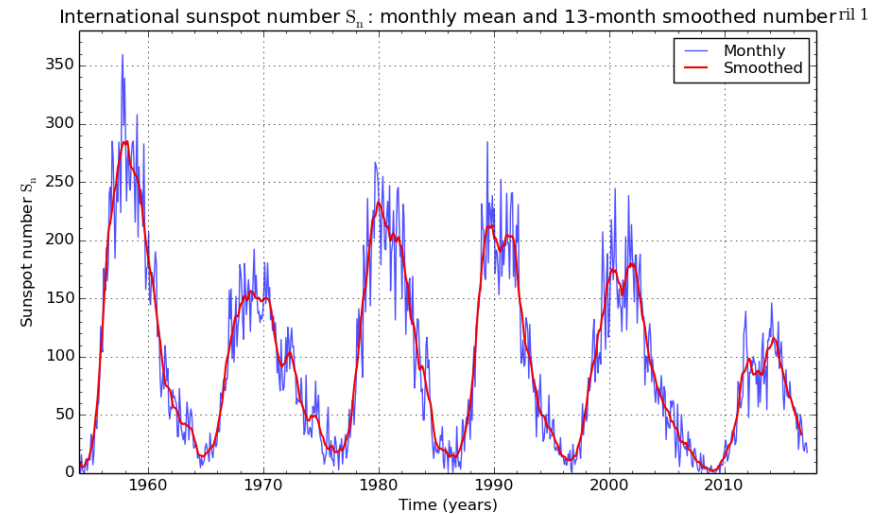
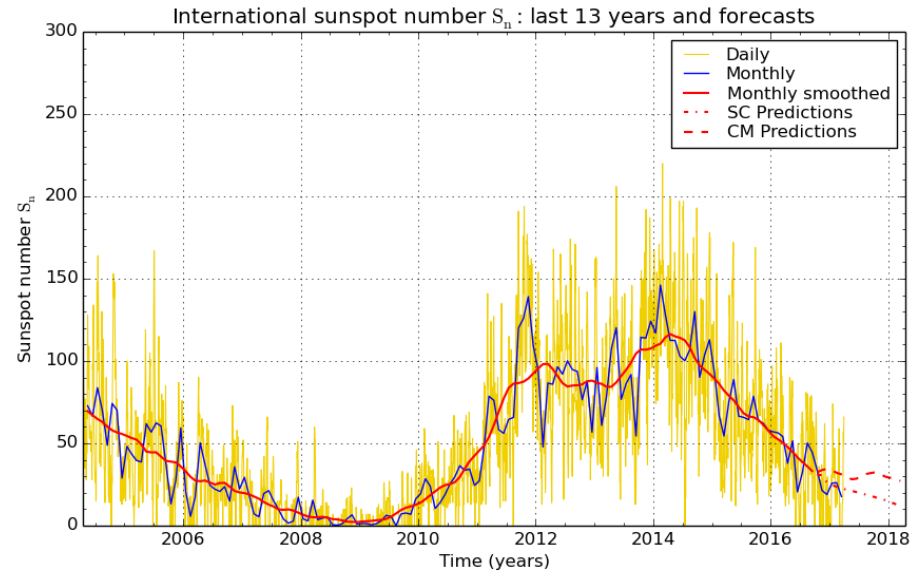
<http://sidc.oma.be/silso/>



SILSO



SILSO graphics (<http://sidc.be/silso>) Royal Observatory of Belgium, 2017 April 18



SILSO graphics (<http://sidc.be/silso>) Royal Observatory of Belgium 2017 April 1

WOLF interface

[Sunspots Collection](#) [Products](#) [Definitions](#) [Rules](#)

User name:

Password:

Locarno Specola Solare is our reference station for the SIDC sunspot index computation.

Please report any anomaly : silso.obs@oma.be

Thank you for your collaboration.

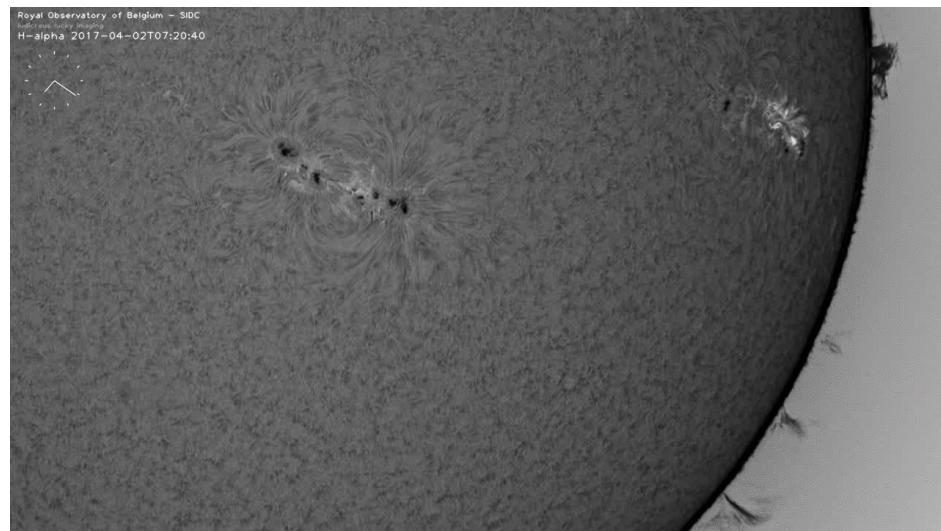
USET

- Uccle Solar Equatorial Table
- Four instruments
 - White Light
 - Drawings
 - Since the 1940's
 - CCD Imagery
 - H-alpha
 - Red end of the spectrum
 - CCD Imagery
 - Call-K
 - Blue end of the spectrum
 - CCD Imagery
- Archives!

<http://www.sidc.be/uset/>



USET



Humain

- Solar Radioastronomy
 - 45-1500 MHz
 - Near real-time
- 6m-dish
 - 2 antennas
 - 3 radio-spectrometers

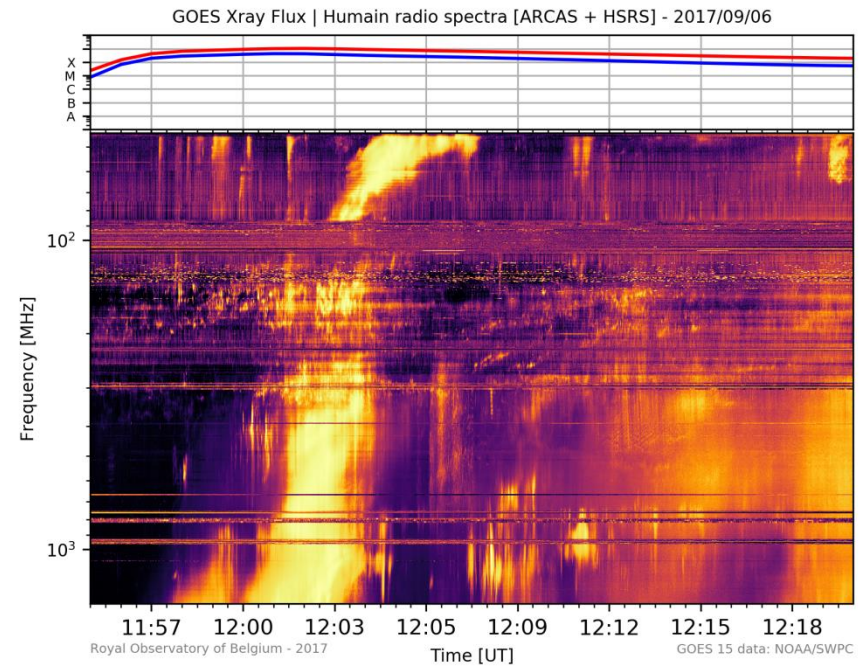
Technical comparison of the radio spectrometers in Humain

	Callisto	ARCAS	HSRS
Frequency band	45 - 447 MHz	45 - 450 MHz	275 - 1495 MHz
Frequency resolution	63 kHz	98 kHz	98 kHz
Time resolution	250 ms	~84 ms	~250 ms
Number of frequencies	200	~4.2 k	~12.5 k

http://www.sidc.be/humain/flux_realtime.php



Humain



The SIDC/RWC

- Regional Warning Centre
 - Space weather
 - Monitoring & Prediction
 - Since 2000
- Team of 6-8 scientists
 - Weekly tour-of-duty
 - IT supported
 - Previweb
 - International
 - ISES, WMO, ESA, ...
 - Services
 - Customers, Mission support, ...
- ESA Space Situational Awareness
 - SSCC
- ESWW

<http://www.sidc.be/>



SIDC/RWC

SIDC - Solar Influences Data Analysis Center

SIDC/RWC-Belgium forecast of 17 Apr 2017 Flares: C-class G

Home
General info
Jobs and Students
Projects
Publications
Sunspots (SILSO)
Software
user guide
Local Solar Observations
Space Weather services
Real Time Data
Seminars

LEGAL NOTICES

ESWW
Classroom
SWSC

Welcome to the Solar Influences Data Analysis Center (SIDC), which is the solar physics research department of the Royal Observatory of Belgium. The SIDC includes the World Data Center for the sunspot index and the ISES Regional Warning Center Brussels for space weather forecasting.

INFO FROM SIDC - RWC BELGIUM 2017 Apr 17 12:30UTC

A C2.0 flare with peak at 02:47 UT was observed from a recurrent active region (NOAA AR 2644) rotating into the visible disk, more C-class flares can be expected and M-class flares are possible (this region produced M-class flares in the previous rotation).

No Earth directed Coronal Mass Ejections (CMEs) have been detected. Solar protons have remained at background levels over the past 24 hours.

Geomagnetic conditions have been at $k = 1-2$ levels. Solar wind speed is now at 315 km/s with interplanetary magnetic fields of 4 nT. A high speed solar wind from an equatorial coronal hole is expected within 48h. Active to minor storm conditions expected.

Latest SWAP image Latest LYRA curve

Latest USET H-alpha image Latest Callisto Observations

Daily estimated sunspot number



From the TV5 documentary:
“La météo de l'espace: l'émergence d'une nouvelle science”

ESWW

Fourteenth European Space Weather Week
Nov 27 - Dec 1, 2017, Belgium

CALL for REGISTER PROGRAM ABOUT DEADLINES WHO CUBESAT & ESWW14 PAST LOGIN

REGISTRATION IS OPEN

REGISTRATION FOR BUSINESS MEETINGS IS OPEN

SUBMIT AN ABSTRACT TO A SESSION

CALL FOR TOPICAL DISCUSSION MEETINGS

The ESWW is the main annual event in the European Space Weather calendar. It is the European forum for Space Weather as proven by the high attendance to the past editions. The agenda will be composed of plenary/parallel sessions, working meetings and dedicated events for service end-users. The ESWW will again adopt the central aim of bringing together the diverse groups in Europe working on different aspects of Space Weather.

Following an excellent response to the call for sessions, the Programme Committee is pleased to invite contributions to sessions, addressing a wide range of scientific and application related themes.

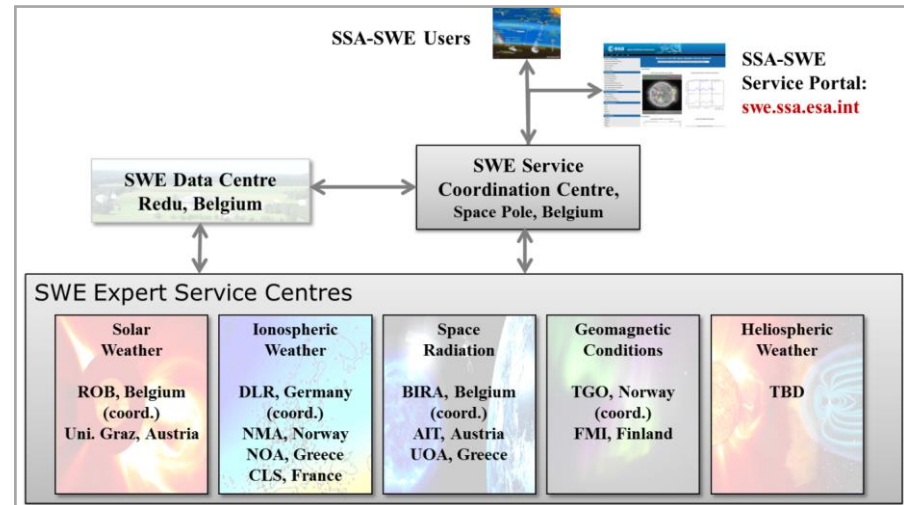
ESWW14 will be held from November 27 - December 1 in Belgium.

The meeting is coordinated by the Belgian Solar-Terrestrial Centre of Excellence (STCE), European Space Agency, ESA and the Space Weather Working Team. The Journal of Space Weather and Space Climate is an ESWW partner. The local organisation is done by the STCE.

ESW

31

eesa **SWSC** Journal of Space Weather and Space Climate



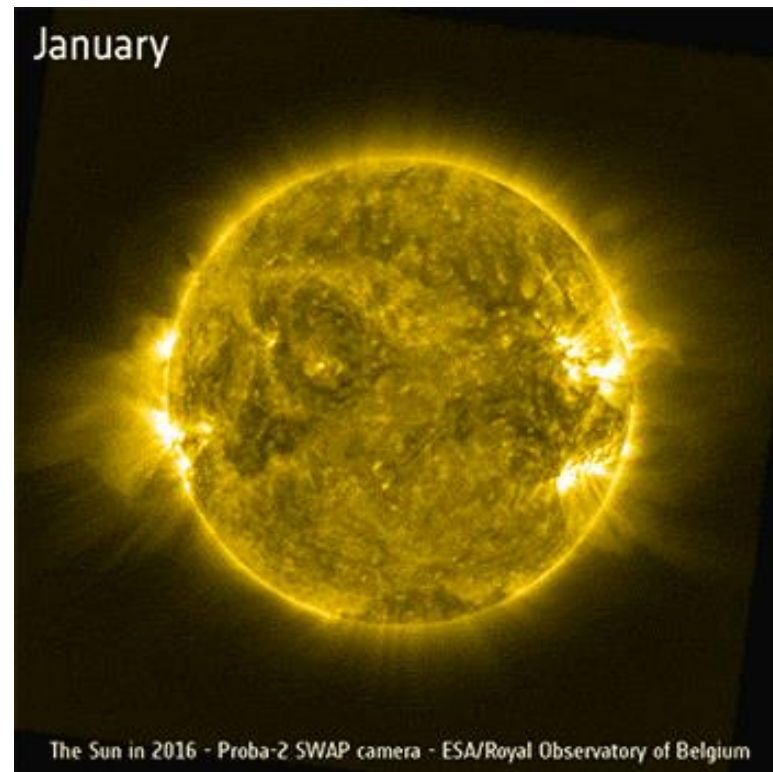
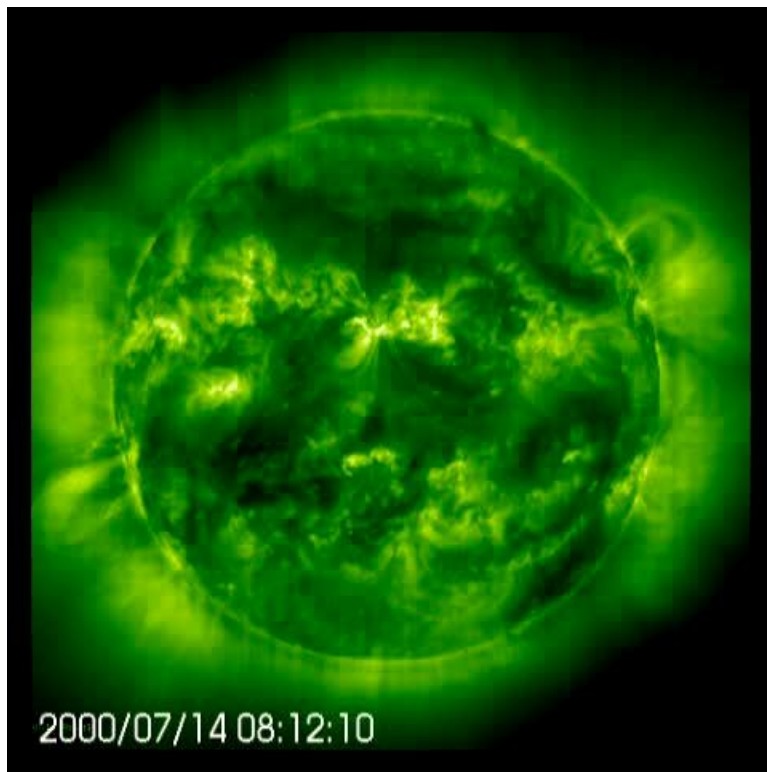
Solar Satellites

- SOHO
 - 1995 - EIT
- PROBA2
 - 2009 – SWAP & LYRA
 - PROBA2 Science Center
- Solar Orbiter
 - February 2019
 - EUI
- PROBA3
 - Late 2019
 - ASPIICS

<http://proba2.oma.be/>



Solar Satellites

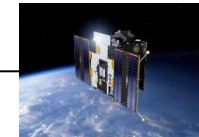
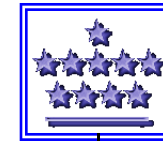


STCL: Instruments

- Space technology & Calibration Laboratories
 - Scientific instruments
 - Development
 - Calibration



<http://www.stce.be/press/05/welcome.html>



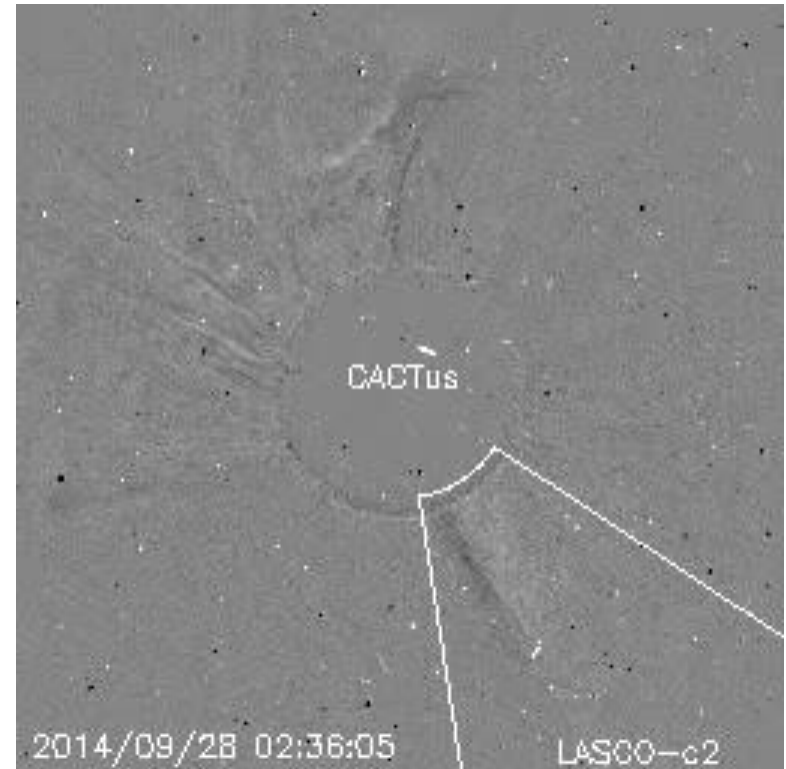
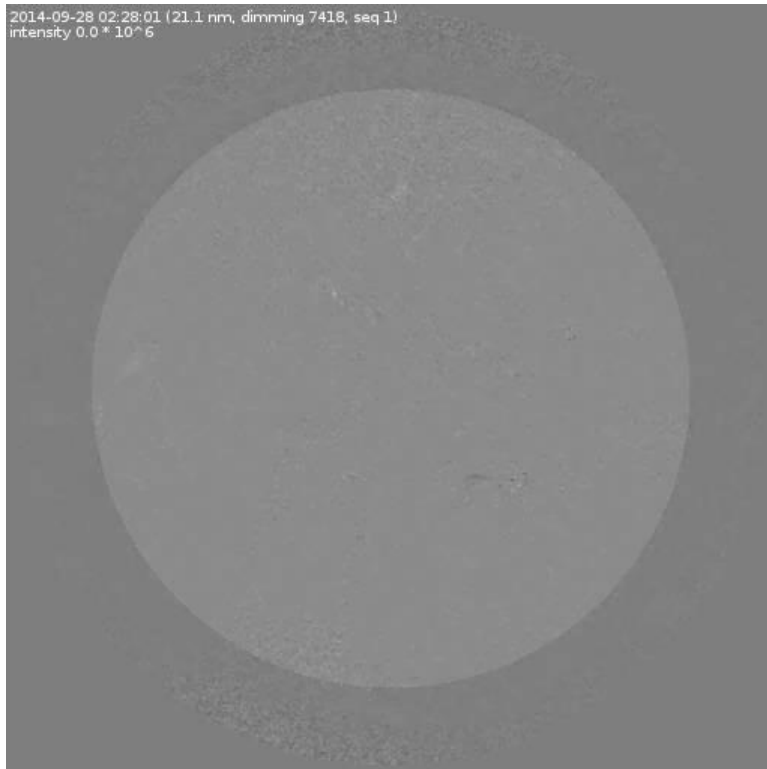
Tools

- Solar Image Processing
 - CACTus
 - Solar Demon
 - SoFAST
 - ...
- Dissemination solar data
 - SWHV
 - STAFF
 - ...

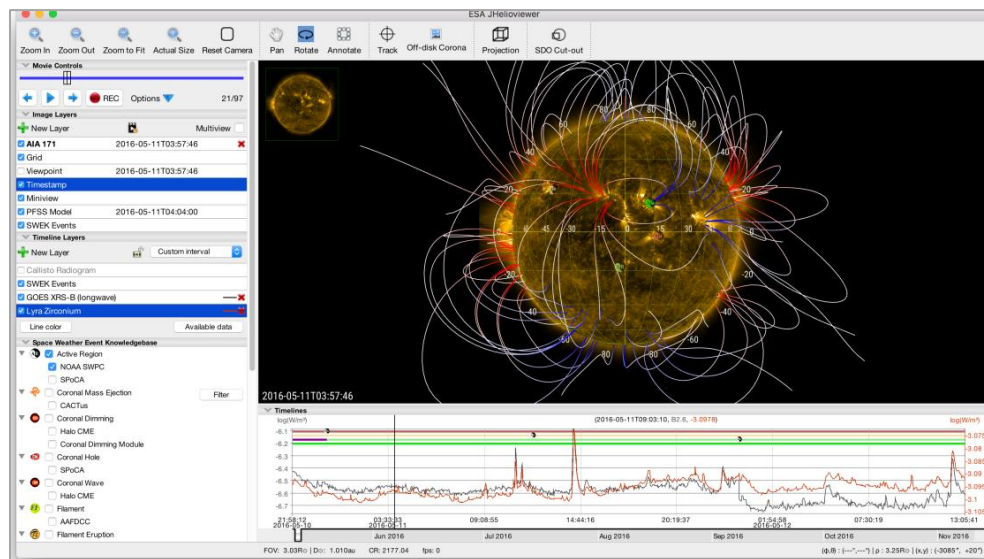
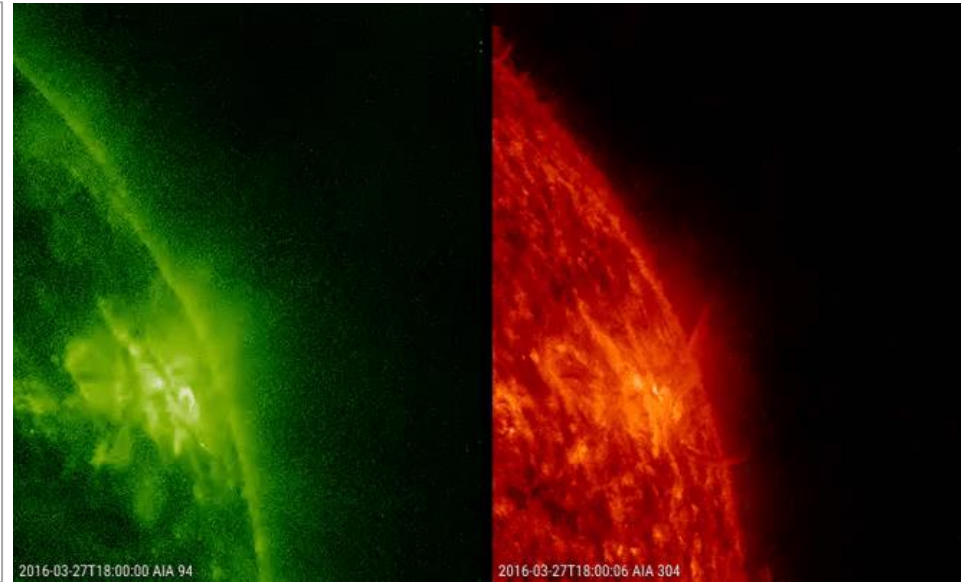
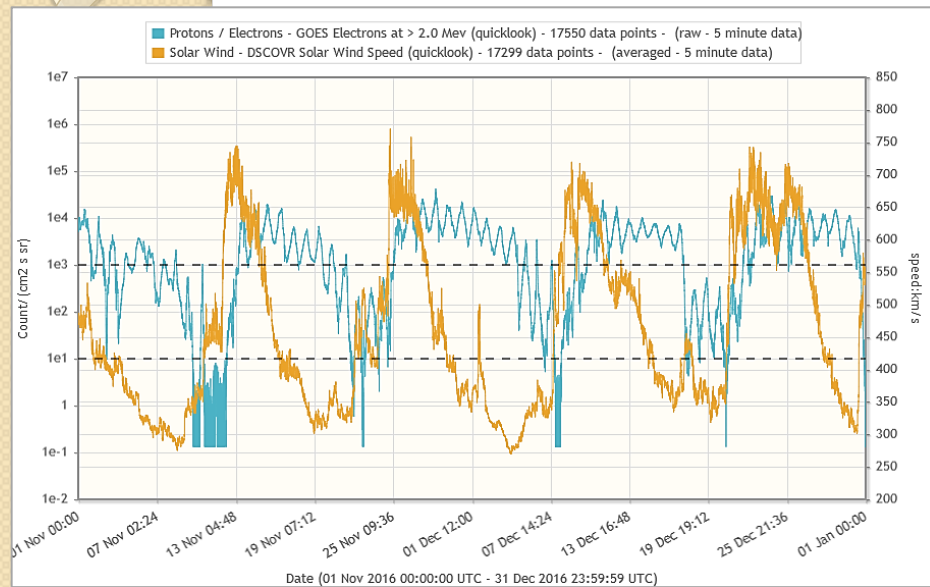
<http://www.sidc.be/sofast/>



Tools / Solar Image Processing

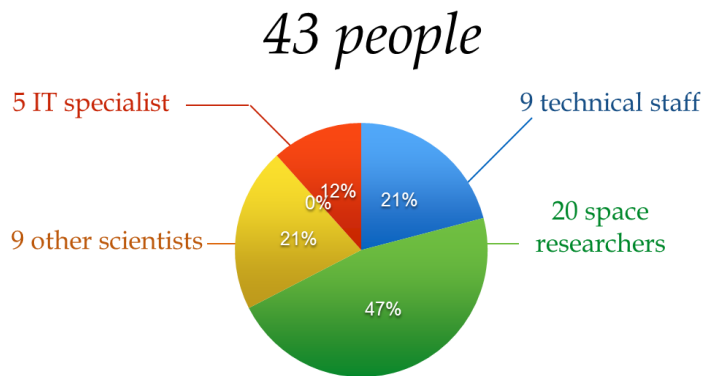


Tools / Solar data dissemination



Science

- A wide variety of research topics
 - Solar activity
 - Space weather
- Projects for funding!



~25 FTE researchers of which 1 PhD student (KULeuven)
 ~ 12 nationalities, most < 45 years



Science

[Go to private page](#) - [Formatted file for the annual report](#) - [Metrics](#)

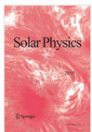
SIDC publications

Author: Year: 2016 ▾ Type: REFERD ▾

Open access disclaimer:
If you have any problem
accessing a paper, please
contact one of the authors.

31 publication(s) found.

"Improved Determination of the Location of the Temperature Maximum in the Corona" Lemaire, Joseph; Stegen, Koen <i>Solar Physics</i> vol. 291 pp. 3659-3683 (2016), 10.1007/s11207-016-1001-3	REFERD
"Projection Effects in Coronal Dimmings and Associated EUV Wave Event" Dissauer, K; Temmer, M; Veronig, A. M; Vanninathan, K; Magdalenic, J <i>The Astrophysical Journal</i> vol. 830 (2016).	REFERD
"An Analysis of Interplanetary Solar Radio Emissions Associated with a Coronal Mass Ejection" Krupar, V; Eastwood, J; Kruparova, O; Santoliki, O; Soucek, J; Magdalenic, J; Vourlidas, A; Maksimovic, M; Bonnín, X.; Bothmer, V; and, 6 coauthors <i>The Astrophysical Journal Letters</i> vol. 823 (2016).	REFERD
"Extreme Geomagnetic Storms - 1868 - 2010" Vennerstrom, S.; Lefevre, L.; Dumbović, M.; Crosby, N.; Malandraki, O.; Patsou, I.; Clette, F.; Veronig, A.; Vršnak, B.; Leer, K.; Moretto, T. <i>Solar Physics</i> vol. 291 pp. 1447-1481 (2016), 10.1007/s11207-016-0897-y	REFERD
"Detailed Analysis of Solar Data Related to Historical Extreme Geomagnetic Storms: 1868 - 2010" Lefevre, Laure; Vennerstrom, Susanne; Dumbović, Mateja; Vršnak, Bojan; Sudar, Davor; Artt, Rainer; Clette, Frédéric; Crosby, Norma <i>Solar Physics</i> vol. 291 pp. 1483-1551 (2016), 10.1007/s11207-016-0892-3	REFERD
"Preface to Topical Issue: Recalibration of the Sunspot Number" Clette, F.; Cliver, E. W.; Lefevre, L.; Svalgaard, L.; Vaquero, J. M.; Leibacher, J. W. <i>Solar Physics</i> vol. 291 pp. 2479-2485 (2016), 10.1007/s11207-016-1017-8	REFERD
"An Early Sunspot Catalog by Miguel Aguilar for the Period 1914 - 1920" Lefevre, L.; Aparido, A. J. P.; Gallego, M. C.; Vaquero, J. M. <i>Solar Physics</i> vol. 291 pp. 2909-2928 (2016), 10.1007/s11207-016-0905-2	REFERD
"The New Sunspot Number: Assembling All Corrections" Clette, Frédéric; Lefevre, Laure <i>Solar Physics</i> vol. 291 pp. 2829-2851 (2016), 10.1007/s11207-016-1014-y	REFERD
"Uncertainties in the Sunspot Numbers: Estimation and Implications" Dudok de Wit, Thierry; Lefevre, Laure; Clette, Frédéric <i>Solar Physics</i> vol. 291 pp. 2709-2731 (2016), 10.1007/s11207-016-0970-6	REFERD
"The Revised Brussels-Lozano Sunspot Number (1981 - 2015)" Clette, Frédéric; Lefevre, Laure; Cagnotti, Marco; Cortesi, Sergio; Bulling, Andreas <i>Solar Physics</i> vol. 291 pp. 2733-2761 (2016), 10.1007/s11207-016-0875-4	REFERD




Solar Physics

May 2016, Volume 291, [Issue 5](#), pp 1447-1481

Extreme Geomagnetic Storms – 1868 – 2010

Authors [Authors and affiliations](#)

S. Vennerstrom , L. Lefevre, M. Dumbović, N. Crosby, O. Malandraki, I. Patsou, F. Clette, A. Veronig, B. Vršnak, K. Leer, T. Moretto

Article

First Online: 19 May 2016

DOI: [10.1007/s11207-016-0897-y](#)

Cite this article as:

Vennerstrom, S., Lefevre, L., Dumbović, M. et al. *Sol Phys* (2016) 291: 1447.
[doi:10.1007/s11207-016-0897-y](#)

[1](#) [348](#)

Citations Downloads

[Download PDF](#) 

[Export citation](#) ▾

[Share article](#) ▾

Article

Abstract

1 Introduction

2 Data and Method

3 Results and Discussion

4 Summary and Conclusio...

Acknowledgements

References

Copyright information

About this article

Abstract

We present the first large statistical study of extreme geomagnetic storms based on historical data from the time period 1868 – 2010. This article is the first of two companion papers. Here we describe how the storms were selected and focus on their near-Earth characteristics. The second article presents our investigation of the corresponding solar events and their characteristics. The storms were selected based on their intensity in the aa index, which

Dissemination

- Via STCE
- Scientific
 - Conferences & workshops
 - ESWW
 - ...
 - Seminars
- Public Outreach
 - STCE Newsletter
 - STCE website
 - Lecturing
 - Annual meeting & report
 - ...
- Media and press items/events

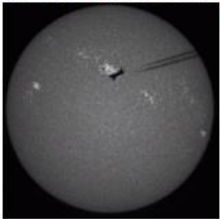
<http://www.stce.be/>



Dissemination



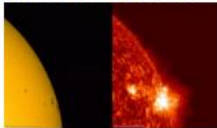
Airplane transits the Sun NEW



On 28 March, USET solar telescopes captured stunning images of a plane transiting the Sun.

[view](#)

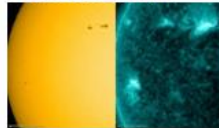
M-class flares à volonté!



On 1 April, the Sun produced its first M-class flare since 29 November 2016. It was the first of a series of 7 M-class flares produced by active region NOAA 2644.

[view](#)

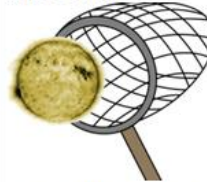
C-class flares at last!



Late on 26 March, the GOES-15 satellite recorded its first C-class flare since 24 February.

[view](#)

A good catch



The officially recordholder of catching non-existing flares works at the STCE. He works at the source of the solar data and 'saw' them first.

[view](#)



Extra-muros contacts

- **ROB**
 - GNSS (Ionosphere)
- **RMI**
 - Dourbes
 - Geomagnetism
 - Solar Irradiance
 - Climate
- **BISA**
 - Magnetosphere
 - Particles, Planeterrella
- **Universities, industries,...**

