Tracking Solar Activity with Online Facilities

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Abstract

Activity in the solar atmosphere, including flares and coronal mass ejections, are the main drivers of space weather. Space weather, in turn, is modulated by the solar rotation period (about a month) and the solar cycle (about 11 years). It is therefore no surprise that researchers have collected a huge volume of data based on years of monitoring solar activity, collecting synoptic quick-look data, and assembling lists of significant events. With the advent of the internet, this monitoring effort has now become accessible to everybody. Many websites provide data that we can use to monitor solar activity and space weather online. In this session we will give a tour of reference websites where one can study the state of the solar atmosphere, its recent evolution and peculiar events.

We will start with a short introduction to various types of instruments in space and on the ground that provide essential space weather data online. We will also highlight the main steps involved in the conversion of raw satellite telemetry to useful, calibrated data products and the familiar pictures and movies made from them.

In the second part of this session we will visit a few websites that provide tools to identify interesting space weather events. When was the last solar flare and how big was it? Is there a coronal mass ejection on its way to the Earth? We will look up pre-assembled event lists—e.g. in the SOTERIA event catalogue—but also check real-time quick-look data.

The session will end with a discussion of the limitations of pre-assembled event lists and quick-look data. While these online facilities are highly convenient, they do not provide a look at original data, but rather somebody else's interpretation of the data. In this sense we prepare for the next session (Downloading and handling solar data from satellites) where we will go further and look at original data ourselves.

Date: Tuesday 19 October 2010
Time: 14:00-17:00
Room: Informatics Laboratory @ Adriatico Guest House

Downloading and Handling Solar Data from Satellites

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Abstract

Most of the observations of the Sun are produced and made available under a so-called open data policy, which means that everybody can freely access them online, use and analyze them, and publish results based on them. In practice, however, working with these observations requires a significant amount of experience and know-how. In this session we will survey several data products based on solar observations and discuss some of the techniques used to analyze these data.

We will begin with an exploration of major space- and ground-based observatories, followed by a look at several data repositories and virtual observatories that collect and distribute these data. (The Virtual Solar Observatory, HELIO, and SOTERIA are a few examples.)

Once we know where the date come from and where to download them, we will discuss and use some common analysis tools to study solar events. Students will download data, learn about metadata and how to use it, and about FITS (Flexible Image Transport System) the most common file format used by astronomers and solar physicists.

We will try some of the tools and techniques used to study data, and experiment with displaying images, making plots, and making movies. We will discuss some common, more advanced image processing techniques such as spatial filtering, Fourier and wavelet analysis, and three-dimensional analysis using STEREO observations.

Date: Wednesday 20 October 2010
Time: 14:00-17:00
Room: Informatics Laboratory @ Adriatico Guest House

David Berghmans

Organisation	**Royal Observatory of Belgium (http://sidc.be, http://www.observatory.be/)**
Job Title	**Work leader, Dr.**

Summary

D. Berghmans is a solar physicist specialized in solar coronal images. He was at the basis of the space weather activities of the Royal Observatory of Belgium. Among his recent realizations are the development of automated software for the detection of CMEs (http://sidc.be/cactus) and the SWAP EUV telescope (http://proba2.sidc.be).

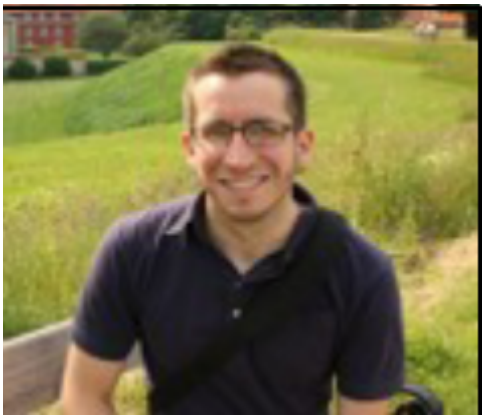
Professional experience

Since 2003	Work Leader at the Royal Observatory of Belgium
Since 2002	(Science) principal investigator for the of the SWAP instrument, an innovative, small EUV imager for space weather monitoring onboard PROBA2.
2001-2002	ESA Research Fellow at ESTEC
Since 1997	Scientist at the Royal Observatory of Belgium. First as post-doc working on the EIT experiment onboard SOHO.

Education

1997	PhD in Sciences, Katholieke Universiteit Leuven (Belgium)
1993	Master of Physics, Katholieke Universiteit Leuven (Belgium)

Nationality	Belgian
Year of Birth	1971



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Profile

Dan Seaton is a solar physicist and the instrument scientist for SWAP at the Royal Observatory of Belgium. His research interests include magnetic reconnection, flare and CME initiation, and coronal heating. Dr. Seaton has worked as a member of the science and operations teams for a number of space-based observatories including TRACE, XRT on Hinode, and, most recently, SWAP on PROBA2. When he is not busy studying the solar corona he spends time racing and writing about bicycles as the European Correspondent for *Cyclocross Magazine.*

Experience

SWAP Instrument Scientist, Royal Observatory of Belgium
Brussels, Belgium, 2008–Present
Analyzed instrument calibration data, developed data analysis and calibration software, and studied and modeled flares and CMEs observed in spacecraft data.

XRT Science Fellow, University of New Hampshire
Durham, NH, USA, 2006–2008
Developed analytic models of reconnecting current sheets during solar eruptions and studied reconnection during flares seen in XRT data.

NSF GK-12 Fellow, University of New Hampshire
Durham, NH, USA, 2003–2006
Worked with high school teachers and students to integrate authentic inquiry in classroom experiences, developed inquiry-based physical science lessons based on solar physics.

TRACE Scientist, Harvard-Smithsonian Center for Astrophysics
Cambridge, MA, USA, 2001–2003
Studied coronal heating based on eclipse and TRACE observations, studied brightenings and flare initiation using TRACE observations, and served as TRACE mission operations planner.

Education

University of New Hampshire, New Hampshire, USA

Ph.D. Space Physics, 2008
Williams College, Massachusetts, USA
B.A. Astrophysics & B.A. Mathematics, 2001