Open Source Solar Image Viewer

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PP	**Restricted to other programme participants (including the Commission Services)**	
RE	**Restricted to a group specified by the consortium (including the Commission Services)**	
CO	**Confidential, only for members of the consortium (including the Commission Services)**	

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NOTICE

1. Introduction

1.1 Scope

This document is the Deliverable Report of Deliverable 6.7 of the SOTERIA Project.

The SOTERIA project is a Project funded by the European Union within the "Seventh Framework Program". SOTERIA aims at creating a wide synergy in the fields of solar-space and geo-physics among different centers in a number of European countries to achieve a higher level of quality and accessibility for the observational data and for the models. Our goal is to help creating the basis for a deeper understanding of solar and space processes having terrestrial impact.

Deliverable 6.7 of the SOTERIA Project is the "Online Source Solar Image Viewer", an online interface that can access in the background solar images stored in a remote VO, and display them interactively (scaling, coloring, overlays) on the end-users screen, together with image metadata, various coordinate systems and/or observed features and events.

1.2 Reference Documents

[R01] SOTERIA Annex I "Description of Work" (SOTERIA_annex_I_rev3.pdf, 12-02-2008)

1.3 Acronyms

CNRS	Centre National de la Recherche Scientifique
EIT	Extreme ultraviolet Imaging Telescope (instrument Onboard SOHO)
FITS	Flexible Image Transport System
GUI	Graphical User Interface
HVAR	Hvar Observatory (University of Zagreb)
KO	Konkoly Observatory
LPI	Lebedev Physical Institute (Russia)
LYRA	Lyman Alpha Radiometer
OBSPARIS	Observatoire de Paris
PMOD-WRC	Physikalisch-Meteorologisches Observatorium Davos
ROB	Royal Observatory of Belgium
SPHINX	Solar PHotometer In X-rays (instrument on CORONAS-PHOTON)
SODA	Soteria Data Archive
SOHO	Solar and Heliospheric Observatory
SOTERIA	Solar Terrestrial Investigations and Archives
SRC-PAS	Space Research Centre, Polish Academy of Sciences
SWAP	Sun Watcher Using APS and image Processing
SWB	Solar Weather Browser
UGEO	University Göttingen (Germany)
UNIGRAZ	Universitaet Graz (Austria)
UOULU	University Oulu (Finland)
USET	Uccle Solar Equatorial Table
VO	Virtual Observatory

2. Context of the work

The SOTERIA project contains significant activities for data dissemination by setting up a Virtual Observatory (see deliverable 6.3). At the same time it was realized that "user requirements for data access go beyond the state-of-the-art Virtual Observatories that only offer downloading of science data products through end-less drop-down menus"[1]. Task 6.2 ("Enhanced data management and assimilation tools") of the SOTERIA project included therefore the development of an "interactive solar image viewer" which would be a "user interface that can access in the background solar images stored in a remote VO, and display them interactively (scaling, coloring, overlays) on the end-users screen, together with image metadata, various coordinate systems and/or observed features and events"

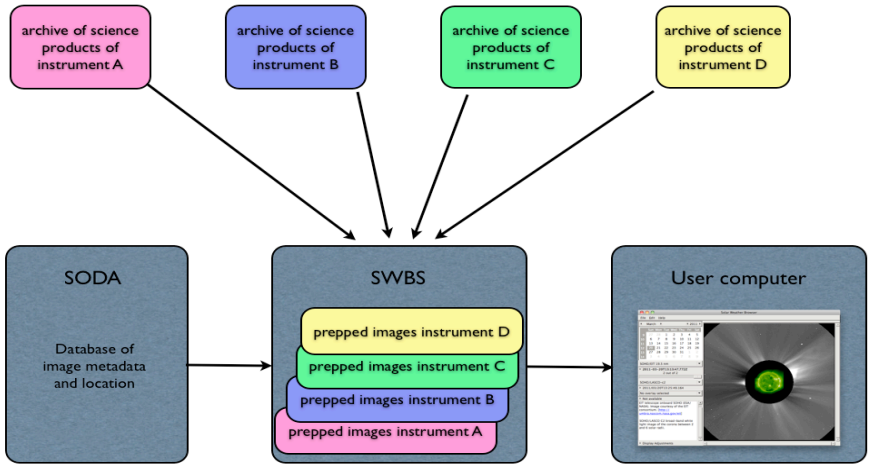
Such an "interactive solar image viewer" existed before under the name *Solar Weather Browser*. It was developed in 2004 at ROB by B. Nicula, and co-funded by ESA in the frame of Space Weather Pilot Project. As the underlying libraries grew outdated and more and more instruments were added, the Solar Weather Browser gradually grew in complexity, both in the interface and the back-end server. The project was temporarily abandoned at the end of 2009 when new bugs appeared in the calendaring system of the Solar Weather Browser.

As announced in the SOTERIA annual reports and newsletters, we decided that the optimal route to develop the SOTERIA "interactive solar image viewer" was to base it on the solid foundation of the Solar Weather Browser, revive its functionalities and link it up with the opportunities brought by SOTERIA.

2. Overview of the delivered Work

The "interactive solar image viewer" will hereafter be named Solar Weather Browser (SWB). In this section we overview the main architecture, the functionalities and the product website. The description is deliberately kept at the executive level, technical details can be found at the product website http://sidc.be/swb

2.1 The main architecture



1 All "..." quotes in the section are extracts from [RD1]

The Solar Weather Browser consists of two parts. The interface is an GUI application running on the user's computer. This interface displays the user selected combination of images and overlays on his display. Transparently to the user, the interface fetches data over the internet from the Solar Weather Browser Server (SWBS). This server contains an archive of preprocessed, date-tagged solar images from different sources (colored boxed on top). These images are preprocessed, asynchronously such that, when the user needs them, they are readily available and a compressed & resized format.

The main advantages of this concept is the simplification for users such as solar researchers and space weather operators:

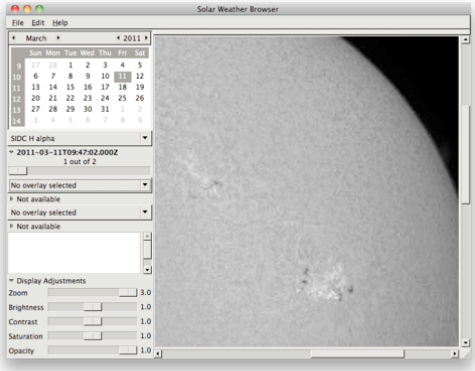
- you do not need to care where on the internet the images come from, and
- you do not need a programming environment

Nevertheless, experience has shown that maintaining the SWBS becomes increasingly complex as more and more instrument archives are added. With the advent of the virtual observatory *SOTERIA Data Archive (SODA),* this promises to become much simpler as the process of image fetching and downloading can be outsourced from the SWBS to the dedicated SODA process (bottom left building block on above graph).

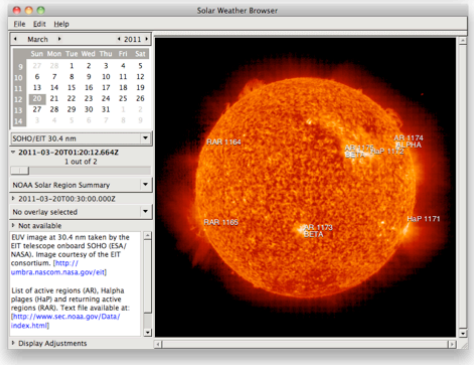
2.2 Functionalities

The various functionalities of the Solar Weather Browser are best demonstrated through the following series of screen-shot examples.

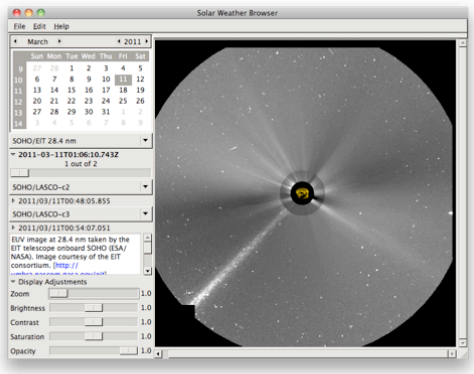
The user has selected SIDC SIDC H-alpha images of March 11 2011and zoomed in to the NW quadrant.



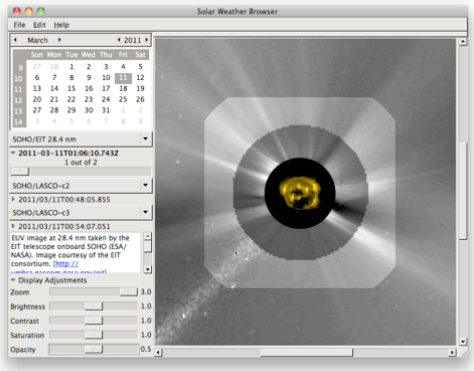
The user has selected EIT 304 images of March 11 2011and overlaid NOAA active region numbers.



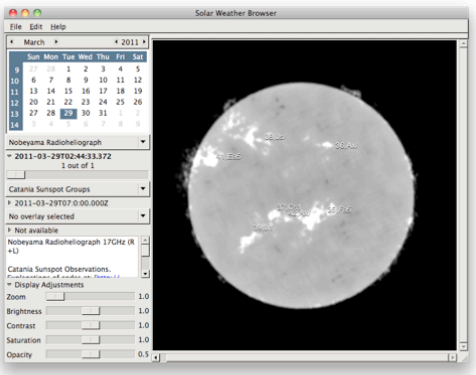
The user has selected a combination of EIT 284 and LASCO C2 and C3 images



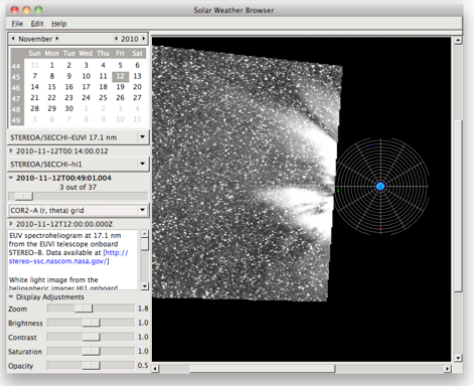
Same selection as above, but now zoomed in and showing through 50% opacity the region where C2 and C3 overlap.



Nobeyama radio images and overlaid MacIntosh sunspot group classification from Catania Observatory.



STEREO-A EUVI and HI-1 images, together with a grid showing the distance covered between the two.



2.3 The website

The product website http://sidc.be/swb is the main source of information on the Solar Weather Browser. Its main sections are:

- introduction of the application and its functionalities
- download and installation: versions for Mac, Unix and MS Windows are freely available under the terms of the GNU General Public License.
- Frequently asked questions
- Acknowledgements, including a reference to the SOTERIA project and the EU FP7 support.

3. Conclusion

An “interactive solar image viewer” called the Solar Weather Browser is fully functional and freely available at http://sidc.be/swb. This report thus closes the Deliverable 6.7.