

SNS • **SORCE News Source**



Solar Radiation and Climate Experiment Monthly Newsletter

September 2008

SORCE Data Processing and New Products Update –

By Doug Lindholm, LASP, University of Colorado

The SORCE science data products were discussed at length in the March 2007 SORCE newsletter (http://lasp.colorado.edu/sorce/news/sns/2007/sns_mar_2007.pdf). Since then, the primary data products have changed little, though the quality has improved as the result of updated calibration data, improved algorithms, and a more reliable software configuration management process (i.e. less bugs). This article focuses more on the technical details of the SORCE Science Data System's data processing system. I will also touch on the present state of SORCE data products, current tools and future plans for data access.

Telemetry data from the SORCE spacecraft are put into a relational database as they arrive at LASP. The SORCE data processing system reads those telemetry data and computes higher level data products. Occasionally, some data don't make it in the first time, but are recovered within a few days. To account for this possible latency, we wait at least two days before we process any data. The science data product generation also depends

on accurate orbital information. We use Two Line Elements (TLEs) from NORAD for this purpose. Latency of the TLE product can be several days. Consequently, we wait at least five days to process data products that rely on solar distance and Doppler corrections.

The data processing software is scheduled to run every night to generate a days worth of science products from telemetry. In addition to the irradiance products, the process creates dozens of intermediate level 2 science products, many of which are stored in a relational database. Additional processing converts the native resolution level 2 products into time-averaged level 3 products with consistent wavelength values. The level 2 products are available for scientific analysis by arrangement with the instrument scientists. This restriction is partially due to the large data volumes, but also because there are subtleties in these data that require special analysis. For data requests please contact the instrument scientists:

TIM – Greg Kopp, greg.kopp@lasp.colorado.edu

SIM – Jerry Harder, jerry.harder@lasp.colorado.edu

SOLSTICE – Marty Snow, snow@lasp.colorado.edu

XPS – Tom Woods, tom.woods@lasp.colorado.edu

The level 3 products, which have a much smaller data volume, are made available to the public via the SORCE and LISIRD web sites.

LISIRD DATA ACCESS

TIME SERIES DATA

Fields marked with a * are required. The default values have been added for you.

* **Choose a Data Set:** Dataset Info

SORCE (115-1600nm) (25-Feb-2003 to present)

* **Enter Time Range:** Valid time formats

Start: 27-Aug-2008

Stop: 26-Sep-2008

* **Enter Wavelength Range (nm):**

Min: 121

Max: 122

Integrate over wavelength:

Plot Data Print Data to Screen Save Data to File

RECENT LYMAN ALPHA PLOT:

SSP Data for Wavelength: 121.500 - 121.500 for 14-May-2003 to 25-Sep-2004

0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000

14-May-2003 14-Jun-2003 14-Jul-2003 14-Aug-2003 14-Sep-2003 14-Oct-2003 14-Nov-2003 14-Dec-2003 14-Jan-2004 14-Feb-2004 14-Mar-2004 14-Apr-2004 14-May-2004 14-Jun-2004 14-Jul-2004 14-Aug-2004 14-Sep-2004

DATE

MERGED DATASETS

Download merged mission data text files (updated weekly):

- **SORCE** (25-Feb-2003 to present, 116-1600nm)
 - .txt file (~91MB)
 - .zip file (~14MB)
- **TIMED-SEE** (8-Feb-2002 to present, 1.0-193.0nm)
 - .txt file (~36MB)
 - .zip file (~5MB)
- **UARS-SOLSTICE** (3-Oct-1991 to 30-Sep-2001, 119-425.5nm)
 - .dxt file (~120MB)
 - .zip file (~16MB)
- **SME** (8-Oct-1981 to 13-Apr-1989, 115-303nm)
 - .dxt file (~58MB)
 - .zip file (~8MB)

Download IDL data file reader

Download IDL code to read and plot these data at any planet

SORCE INTERACTIVE DATA ACCESS MENU

- Spectral Time Series
- Solar Spectra
- Total Solar Irradiance
- XUV Irradiance (Broadband)
- MgII Index
- SORCE Interactive Data Access Home Page
- SORCE Mission Home Page

SORCE
Interactive Data Access

Solar Spectral Data Access from the SIM, SOLSTICE, and XPS instruments

This web page can be used to retrieve a solar spectrum with a spectral resolution of 1 nm. The data products available via this interface consist of **SOLSTICE Level 3**, **SIM Level 3**, and **XPS Level 4 (modeled)**. Fields marked with an * are required. All other fields are optional.

***ENTER DATE:**
(VMS, LA, or SORCE day format)

- VMS: 21-Apr-2004
- LA: 2004/112-00:00:00
- SORCE day: 453 (Note: SORCE day 1 is 25-Jan-2003)

*Date:

ENTER A WAVELENGTH RANGE:
(valid range: 0.1-40nm & 115-2400nm)

Min Wavelength:
Max Wavelength:

OTHER OPTIONAL PARAMETERS

Show error bars on plot:
Plot on a log scale:

Most Recent SORCE Spectral Plot:

SORCE Solar Spectrum for 26-Sep-2008 (wavelength=116.50 - 2412.3 nm)

Intensity (W/m²/nm) vs Wavelength (nm)

Convenient Access Merged Data Files

Data Set	Zip Text	Zip IDL Savefile	NetCDF	Zip NetCDF	File Reader
SSI Composite Data File	30MB				IDL
SIM Data Files	20MB	20MB			IDL
SOLSTICE FUV Data Files	1MB	2MB			IDL
SOLSTICE MUV Data Files	3MB	3MB			IDL
XPS Level 4 Daily 0.1nm Data File			3MB		IDL
XPS Level 4 5-min 0.1nm Data File				4MB	IDL
XPS Level 4 Daily 1nm Data File			400KB		IDL

Plot Data Output Data as Text Output Text & Plot Data

If you have any problems, please contact the SORCE Webmaster.

The SORCE Data Access and Summary web page (<http://lasp.colorado.edu/sorce/data/>) summarizes the publicly available data products. It includes links to more information about each instrument, links to full mission data files and IDL code to read them, and links to interactive data access tools where you can select time and wavelength ranges and get back the data and/or a plot of the data. Similar interfaces to the SORCE data and other LASP solar irradiance data products can be found on the LASP Interactive Solar Irradiance Datacenter (LISIRD) site (<http://lasp.colorado.edu/lisird/>).



The SORCE Data Systems group and the instrument scientists regularly analyze the newly generated data products looking for inconsistencies and areas for improvement. Updating degradation calibrations is a common correction that we try to apply a few times a year. There are often other calibration and algorithm improvements. When these changes are introduced, we reprocess the data for the

entire mission and release a new versioned data product (by instrument). The data access web sites are designed to serve the most recent version of the data at all times.

The current publicly available SORCE data products are itemized in the table below. We plan to do at least one more reprocessing for each instrument before the fall meeting of the American Geophysical Union (AGU) in December, where we will have a "SORCE Data Products" poster with more details about the latest SORCE science data products.

Summary of SORCE Data Products
(available from <http://lasp.colorado.edu/sorce/>)

Product	Temporal Res.	Instr.	Spectral Coverage	Data Level	Data Vers.
TSI	Daily and 6-Hour	TIM	All λ	3	8
SSI	Daily	XPS	0.1-27 nm	3, 4	9
		SOLSTICE	115-310 nm	3	9
		SIM	310-2400 nm	3	16
Hi-Cadence XUV	5-minute	XPS	0.1 - 40 nm	4	9
Space Weather Mg II	Several per day	SOLSTICE	280 nm	2	9

Recent and Upcoming Changes in the SORCE Science Data System –

Until recently, the SORCE data processing was conducted on a group of Sun Sparc machines. As these systems are reaching their end-of-service-life, we are migrating the processing and ancillary jobs to a collection of new Red Hat Enterprise Linux machines. The new-found processing power has enabled us to consolidate all the routine daily processing to a single high availability server. The new hardware, in conjunction with the Condor job distribution software from the University of Wisconsin (<http://www.cs.wisc.edu/condor/>), has allowed us to reprocess data in a fraction of the time it took on the old hardware. In some cases, it would take a week to reprocess a new version of one of the SORCE instrument's data products. Now, it can be done in a few days.

As part of the Solaris to Linux migration, we are improving our software development and release process. The current processing code (primarily Java) and tools (primarily IDL) are stored in a Subversion (<http://subversion.tigris.org/>) version control system which is maintained by the LASP IT department. We also track bugs and other "issues" in a web-based JIRA (<http://www.atlassian.com/software/jira/>) issue tracking system. These software tools help us to maintain reproducibility and to manage tasks.

We currently have a long wish list in JIRA. Of primary interest is automated monitoring of the SORCE Science Data System (SDS). There are now a number of processes that provide metrics that help us to monitor the health of the processing jobs. However, this involves humans parsing log files. We are currently working on a comprehensive set of interchangeable monitors for hardware issues such as disk space to looking for gaps in the telemetry to quality analysis of science data products. The results of the autonomous monitors will be summarized on a single web page, providing a quick look at system health. The monitoring system also has the ability to send email or text message notifications. Finding problems early improves our chances of recovering or correcting data. Due to the nature of its modular design, the creation of an individual monitor has proven to be an excellent project for some of the many students that LASP employs.

We are also looking to expand our data access options. This work is being done in coordination with LISIRD and the Virtual Observatory community. Current options are limited to static file downloads and interactive access of a single product. One glaring omission is a programmable interface to the data. We are currently prototyping an OPeNDAP (<http://opendap.org/>) server that will deliver data subsets directly to a user's computer program. Client software to request and read data from an OPeNDAP server is already available from the OPeNDAP community for many programming languages and tools including C, C++, Java, IDL, Matlab, and python.

We would also like to improve the interactive tools on the data access web sites. Some ideas involve integrating different datasets into a single view that can be manipulated interactively by the user. If you have any suggestions for data products or tools, please send them to Doug Lindholm (doug.lindholm@lasp.colorado.edu).



Upcoming Meetings / Talks –

SORCE scientists plan to present papers or attend the following 2008 meetings:

- WHI (Whole Heliosphere Interval) Data and Modeling Assessment Workshop, Aug. 25-29, Boulder, CO
- CALCON Technical Conference, Aug. 25-28, Logan, UT
- International Space Science Institute (ISSI) Meeting, Sept. 23-26, Bern, Switzerland
- 5th Annual Canadian Solar Workshop, Nov 5-7, Montreal, Canada
- AGU Fall Meeting, Dec. 15-19, San Francisco, CA

**To submit information to this newsletter, please contact:
vanessa.george@lasp.colorado.edu**

663,144

Hits to the SORCE Website

(Since 4/21/03, As of 9/26/08)