

SNS • **SORCE News Source**



Solar Radiation and Climate Experiment Monthly Newsletter

April 2004

SORCE Website – Over 51,000 Hits!

51,794
Hits to the SORCE Website
(Since 4/21/03, As of 4/26/04)

Since April 21, 2003 – three months after launch – we have been tracking the SORCE website “hits”. Averaging over 4,160 hits per month, the hits seem to peak with SORCE Science Meetings and solar events, such as the flares in October-November 2003.

The most regularly visited pages are the instrument data access pages, which are updated regularly. Total Solar Irradiance (TSI) data from the TIM instrument can be downloaded in text format on the TSI data access page (http://lasp.colorado.edu/sorce/tsi_data.html). Very soon Solar Spectral Irradiance (SSI) data from the SOLSTICE, SIM, and XPS instruments will be available in text format and as an *IDL save file* on the SSI data access page (http://lasp.colorado.edu/sorce/ssi_data.html). For accessing specific SSI data, plans are in the works to create a web page that will allow users to input values into form fields and then plot the data to the screen or to a file depending on user input.

People also frequently visit the SORCE instrument pages and the SORCE news page.

Preparing the “new” SORCE website before the launch was a full time undertaking for two people at LASP – Ann Windnagel and Anh Dang. They began developing the current detailed version in July 2002. Since then it has quadrupled in size!

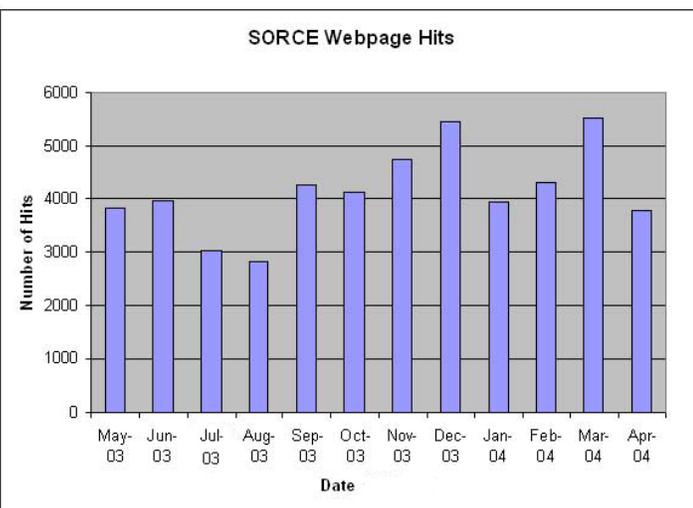
Thanks to their efforts, the SORCE website is extremely useful and easy to navigate. Main headers include Science, Data, Instruments, Spacecraft, Mission, Education and Outreach, News and Events, and References. Within each one of these categories is a sub-listing of additional topics to explore. Please, visit us often for the latest SORCE information – <http://lasp.colorado.edu/sorce/>.



LASP's Ann Windnagel maintains the SORCE website and is responsible for keeping information current. She also does the data processing for SORCE's XPS instrument. Ann joined LASP full-time over 4 years ago, after graduating from the University of Colorado with a degree in Applied Mathematics.

SORCE's TIM Team Moves Ahead –

Robert Lee visited LASP in early April to discuss the Total Irradiance Monitor (TIM) results and instrument performance with TIM instrument scientists George Lawrence and Greg Kopp. Mr. Lee is the Principal Investigator of the Earth Radiation Budget Experiment (ERBE) on the Earth Radiation Budget Satellite (ERBS), which has acquired a 20-year record of TSI measurements and is still functioning nominally with very little degradation. Bob is also one of the members of the National Polar Orbiting Operational Satellite Sys-



The SORCE website monthly “hits”. April 2004 is a partial month running through April 25th.

tem (NPOESS) Operational Algorithm Team (OAT). His visit here was in his OAT capacity to review the *SORCE* TIM instrument and analysis algorithms, as these are precursors to those selected for flight on NPOESS. Through the morning, Bob gained a deeper appreciation for the stability of the TIM and the careful thought George put into its design, and is well prepared to help the OAT review the NPOESS TIM.



Scientists met recently to review the TIM data collected over the last year. Shown left to right are: Greg Kopp, TIM Instrument Scientist from LASP; Robert Lee from NASA Langley Research Center; and LASP's George Lawrence.

SORCE Papers Published –

The Signature of Solar Activity in the Infrared Spectral Irradiance, by Juan Fontenla

The first scientific paper using SIM data, ***The Signature of Solar Activity in the Infrared Spectral Irradiance***, by Juan Fontenla, J. Harder, G. Rottman, T. Woods, and S. Davis, is in the April 10, 2004 edition of *Astrophysical Journal Letters*. Following is the abstract:

The effects of solar activity on the spectral irradiance have been studied using atmospheric semi-empirical models developed from observations of the various surface features observed on the Sun. From these models it has been the long standing belief that the contributions of active regions to solar irradiance at wavelengths in the range of 1.2-3 μm is negative, that is, their net effect reduces the overall solar irradiance at these wavelengths by a small amount.

In order to validate the current modeling we use the observed plage areas to compute the solar irradiance variations at two bands (centered at 0.516 and 1.553 μm wavelength). We compare in detail the predictions of the models of Fontenla et al. (1999) with measurements of the solar spectral irradiance variations obtained by the Spectral Irradiance Monitor (SIM) instrument aboard

the Solar Radiation and Climate Experiment (SORCE) spacecraft. The data comparison extends over a six-month period in 2003 that covers several solar rotations.

The comparison indicates that the variations in the short wavelength display good agreement between models and observations, but that the current models of IR spectral irradiance are inaccurate at the long wavelength. This disagreement in the IR may be due to the fact that, contrary to the current model assumptions, the presence of active regions on the disk increases the spectral irradiance at all wavelengths, even near 1.6 μm . Consequently, the modeling of solar spectral irradiance at wavelengths in the range around 1.6 μm should be re-examined and revised to match the new observations.

Solar Irradiance Variability During the October 2003 Solar Storm Period, by Tom Woods

Solar Irradiance Variability During the October 2003 Solar Storm Period, by Tom Woods, F. Eparvier, J. Fontenla, J. Harder, G. Kopp, W. McClintock, G. Rottman, B. Smiley, and M. Snow, will be published soon in AGU's *Geophysical Research Letters*. Following is the abstract:

The extraordinary solar storms between 18 October 2003 and 5 November 2003 include over 140 flares, primarily from two different large sunspot groups. There were 11 large X-class flares during this period, including an X17 flare on 28 October 2003 and an X28 flare on 4 November 2003. The X28 flare is the largest flare since GOES began its solar X-ray measurements in 1976. The solar (full-disk) irradiance during these flares was observed by the instruments aboard the NASA Solar Radiation and Climate Experiment (SORCE) spacecraft and the NASA Thermosphere, Ionosphere, Mesosphere, Energetics, and Dynamics (TIMED) spacecraft. The total solar irradiance (TSI) dropped by unprecedented 0.34% during this period due to the dark, large sunspots. In addition, the TSI increased by 270 ppm during the X17 (4B optical) flare on 28 October; the first definitive measurement of a TSI flare event. The ultraviolet (UV) variations for this X17 flare range from a factor of about 50 shortward of 10 nm to about 10% for the Mg II 280 nm emission. One interesting result for the UV flare variations is that the broad wings of the H I Lyman- α (121.6 nm) emission increased by more than a factor of 2 during the X17 flare while the core of the Lyman- α emission only increased by 20%. Another interesting result is the time profile of the Si III 120.6 nm emission, which shows a sharp 1-minute long increase by a factor of 17 during the impulsive phase.

Reprints of both of these papers will be mailed to the *SORCE* mailing list when they arrive.

2004 *SORCE* Science Meeting in Planning Stages –

The groundwork is in place for another excellent *SORCE* Science Meeting in Fall 2004. The meeting – ***Decadal Variability in the Sun and Climate*** – is set for October 27-29, 2004 in Meredith, New Hampshire, which is a small town on Lake Winnepesaukee. The agenda will consist of both invited and contributed oral presentations and posters. Everyone is encouraged to participate and we hope you will share this announcement with colleagues.

Discerning the role of the Sun in climate variations on time scales of decades is a challenging task. That climate forcing is well correlated with variations in the Sun's energy output is now relatively well established for total and UV irradiance using high-precision, space-based solar measurements spanning more than two decades. When the Sun is near the maximum of its activity cycle, it is about 0.1% brighter overall, with much greater changes at UV wavelengths. *SORCE* measures these variations with unprecedented accuracy, precision, and spectral coverage across the UV, visible, and IR. But the climate response to these measured solar variations presents a major puzzle. This *SORCE* Science Meeting seeks new understanding of the evidence for and mechanisms involved in decadal variability in the Sun and climate.

Widespread empirical evidence from the extensive Earth climate datasets suggests the presence of an 11-year solar signal of order 0.1K in surface, atmospheric, and ocean temperatures. But general circulation models (GCMs) underestimate this response by as much as a factor of five. The GCMs account primarily for direct forcing by changing incoming total radiation and assume that the response time for climate feedback processes to this external forcing is of order 100 years. Processes and pathways not included in the GCMs may help facilitate

the larger than predicted climate response to decadal solar variability. Solar variations in the UV spectrum modulate stratospheric ozone concentrations, which may couple to climate via radiative and dynamical pathways. These pathways may involve the Northern and Southern annular modes, allowing a solar signal to be amplified and reach Earth's surface. Internal atmosphere-ocean oscillations such as the NAO and ENSO may also play a role. Clouds may expedite the feedback process, as they appear to also exhibit variability with the solar cycle. Stochastic climate variability may amplify the relatively small solar variations. Other, non-linear, climate processes are speculated.

At this *SORCE* Science Meeting we hope to relate current understanding of the solar variability with climate effects and potential climate response mechanisms. Topics will include:

- Decadal variability in the atmosphere and coupling to climate
- Decadal variability in the oceans as climate drivers
- Tropical climate variability modes (ENSO)
- High latitude climate variability modes (NAO/AO, PDO)
- Non-linear/stochastic climate response processes
- Mechanisms and modes of decadal solar variability

The science program organizing committee members are Mark Baldwin from NorthWest Research Associates, Inc., Bellevue, Washington; Greg Kopp from LASP, University of Colorado; and Judith Lean from Naval Research Laboratory, Washington, DC.

Additional speaker and abstract information will be available soon. Please put the *SORCE* meeting dates on your calendar now – October 27-29. For meeting updates, please visit our website – <http://lasp.colorado.edu/sorce/2004ScienceMeeting.html>.

Upcoming Meetings / Talks –

SORCE scientists plan to present papers or attend the following 2004 meetings:

AGU / CGU Meeting, May 17-21, Montreal, Canada

AAS / Solar Physics Division, May 30-June 3,
Denver, Colorado

COSPAR Meeting, July 18-25, Paris, France

SORCE Science Meeting, October 27-29,
Meredith, New Hampshire

AGU Fall Meeting, Dec. 13-17,
San Francisco, California

To submit information to this newsletter, please contact:
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Church Landing is a new facility at The Inn at Mill Falls, where the next *SORCE* Science Meeting will be held. The Inn's website is <http://www.millfalls.com/>.