



## ***Research Proposal Accepted by ISSI, Bern Switzerland –***

*By Jerry Harder, LASP, University of Colorado*

Juan Fontenla and Jerry Harder participated in writing a 2007 International Space Science Institute (ISSI) proposal that was accepted this month. The team leader for this research activity is Ilaria Ermolli of Rome Observatory along with 6 other researchers from European and American research institutes. The title of the proposal is “Interpretation and modeling of solar spectral irradiance measurements”, so **SORCE** activities, both measurements and modeling efforts, fit well into the theme of this collaborative effort.

The thrust of the research effort is to evaluate and compare existent time series of spectral irradiance data sets and then use them in conjunction with critical observations of the solar disk (such as the SOHO MDI and Kitt Peak magnetograms) and models of the solar atmosphere to quantify and characterize the role of solar features needed to explain both the rotational modulation and the longer term trends descending into the current solar minimum.

Another important aspect of this ISSI sponsored program is that they intend to support additional young scientist within about 2 years of completing their PhD programs, and we look forward to collaborating with the next generation of solar scientists. Presently, the team is scheduling a time to meet at the ISSI facility in Bern, Switzerland, refining the agenda, and selecting the additional team members to begin this program.

## ***SORCE Participates in REU Student Internship Program –***

**SORCE** scientists have 3 student interns this summer as part of NSF’s Research Experience for Undergraduates (REU) program. The purpose of the program is to provide students with an opportunity to work with scientists on projects spanning the field of solar and space physics, from instrument hardware to data analysis to modeling of the Sun-Earth system.

The REU program began with a week of lectures on solar and space physics, which three **SORCE** scientists



Jerry Harder and Tom Woods are working on solar spectral irradiance variability using **SORCE** SIM data with Thomas Zimmerman from the University of Iowa.

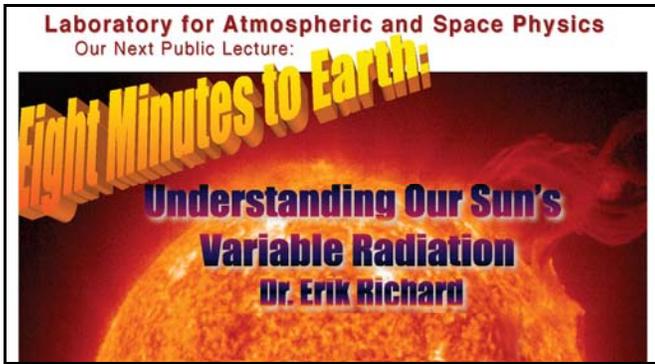
participated in. Jerry Harder presented “Solar Irradiance/Radiometry”, Tom Woods covered “Current and Future Solar Observing Missions”, and Erik Richard discussed “Spectroscopy and Instrument Design”. The next 9 weeks will be spent on a specific project with a scientist in that field. In early August, students will present their research findings, and the best projects will be selected for submission to a national scientific conference.



Marty Snow (right) is mentoring two students – Jonathan Ruel (left) from Fort Lauderdale, Florida is working on the LISIRD data base and Julius Allison (center), who attends Alabama A&M University, is analyzing **SORCE** lunar data from the SOLSTICE instrument.

## Erik Richard Concludes LASP's 2007 Public Lecture Series –

SIM scientist, Erik Richard gave the final talk for the 2006-2007 LASP Public Lecture Series in early June. The lectures are intended for a general audience of all ages and backgrounds.



He presented an overview of solar variability as measured by space-based instruments with a particular emphasis on what we have learned from the *SORCE* mission. He also described in clear and non-technical terms the origins of solar features, such as sunspots and facular regions, based on changes of the solar magnetic fields. At the end of the presentation, he tied together the importance of these solar influences to the problem of understanding the Sun's role in the Earth climate system.

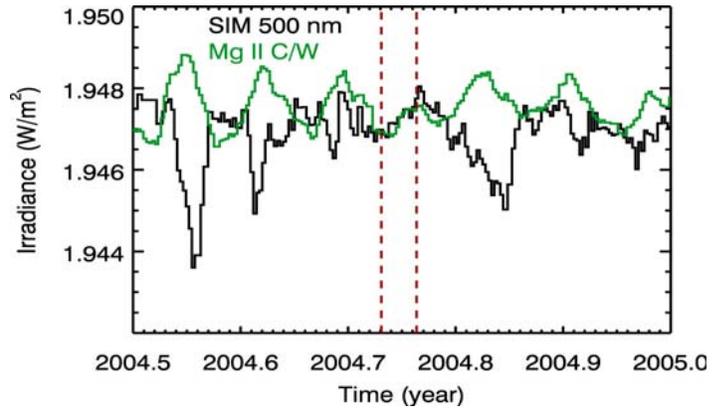
## Tom Woods to Attend 2007 IUGG–

By Tom Woods, *LASP, University of Colorado*

Tom Woods will be attending the IUGG 2007 Meeting in Perugia, Italy to present an invited talk on “*Solar Irradiance Variability Results from NASA's SORCE Mission*”. He will be discussing the TSI and SSI from 0.1 - 34 nm and from 115 - 2400 nm, which *SORCE* has been measuring since 2003.

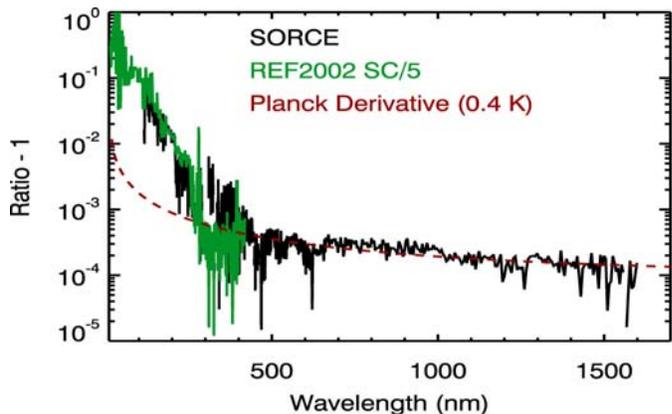
The Sun is the only external forcing for climate changes, thus the solar irradiance and its variability are important input for studies of the energetics of Earth's atmosphere, surface, and oceans. A brief overview of the solar irradiance and its variability as a function of time and wavelength is given during the *SORCE* mission starting with high solar activity in 2003 to the low solar activity in 2007. Some example solar variations are shown in the following figures.

The dominant temporal variations are due to flares (minutes-hours), active region evolution and solar rotation (days), and solar cycle magnetic evolution (months-years). The variations in wavelength are dependent on where the emissions arise. The photospheric emissions, which dominant in the near infrared, visible, and near



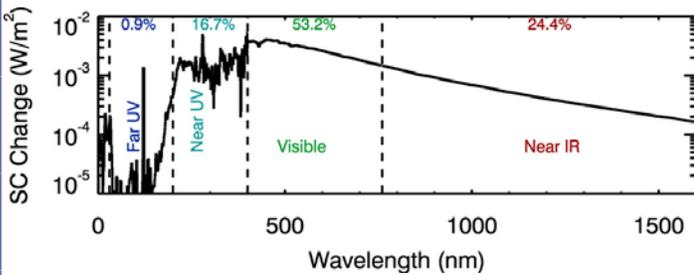
**Figure 1.** The *SORCE* SIM irradiance at 500 nm and SOLSTICE Mg II core-to-wing ratio (C/W) are shown for the later half of 2004. Most solar rotations show decreases for the photospheric 500 nm irradiance due to dark sunspots and increases for the chromospheric Mg II C/W due to bright plages that occur above the sunspots in the solar atmosphere. Occasionally, as marked by the red lines, both photospheric and chromospheric emissions show increases that are related to bright faculae / active network domination rather than sunspots / plages.

ultraviolet ranges, vary by about 0.1% over the 11-year solar cycle and are characterized by dark sunspots and bright faculae. The emissions from the solar chromosphere and transition region are easily identified in the extreme ultraviolet and far ultraviolet ranges, and their solar cycle



**Figure 2.** An example solar rotation variation is given as the ratio of the solar spectra for the times indicated in Figure 1 by the red lines. The *SORCE* results for spectral variability agrees well with the REF2002, which is based on UARS measurements given by Woods and Rottman (*Comparative Aeronomy in the Solar System*, Geophys. Monograph Series, 130, Wash. DC, pp. 221-234, 2002). One basic concept from initial analysis is that the “average” temperature of the Sun can be an estimate of the spectral variability above 400 nm as estimated by the red line. In actuality, a global temperature change on the Sun is unrealistic, but the “average” temperature is most likely related to the changes in the area of the hotter (faculae) and cooler (sunspots) regions on the solar disk.

variations of 20% to factor of 3 are associated with the evolution of the bright plage and active network features on the Sun. Finally, the coronal emissions, which dominate in the X-ray and the lower part of the extreme ultraviolet range, vary the most by factors of 5 to 1000 over the solar cycle.



**Figure 3.** The solar cycle variation is estimated by scaling the solar rotation variation given in Figure 2 by a factor of 5 and then converted to energy units. About half of the solar cycle variation is from the visible, and the other half is split about equally in the ultraviolet (UV) and infrared (IR) ranges.

## ***SORCE Spacecraft Anomaly Summary –***

The SORCE spacecraft On-Board Computer (OBC) anomaly on Monday, May 14, day 2007/134, has been resolved. The spacecraft, including instruments, was fully recovered on Sunday, May 20, and is back doing normal solar observing



sequences. All instruments survived the initial safe hold period just fine, and everything continues to operate normally since the recovery. The root cause for the anomaly is still under investigation by LASP and OSC engineers, but due to the nature of the anomaly a definitive answer may not be forthcoming. There is a 6-day gap in the SORCE science data for 2007/135 through 2007/140, May 15-20, which cannot be recovered as the instruments were off. This is considered a small impact on SORCE science as the SORCE mission focuses primarily on climate changes over months to years.

The analysis of data downloaded since May 20 shows no unusual degradation for any of the instruments. We will continue to closely monitor the data to fully verify the long-term trends, if any, from this safe hold. The only unusual instrument finding appeared in the SIM data, which showed a small, one-time wavelength shift. This is a minor concern as this small wavelength shift can easily be corrected in the next version of SIM data products.

**320,723**

**Hits to the SORCE Website**

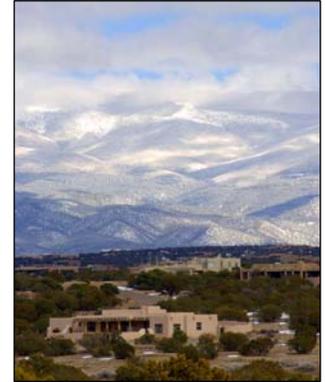
*(Since 4/21/03, As of 6/22/07)*

## ***2008 SORCE Science Meeting –***

***Feb. 5-7, 2008***

***La Posada de Santa Fe Resort & Spa  
Santa Fe, New Mexico***

Acknowledging SORCE's 5<sup>th</sup> anniversary, the meeting's theme and title is ***SORCE's Past, Present, and Future Role in Earth Science Research***. The meeting will focus on solar irradiance variability and the modeled and measured response to this variability of Earth's atmosphere and climate. Of particular interest are models that incorporate the physical processes thought to facilitate the Sun-Earth connection. Coupled with accurate solar and climate measurements, these models are critical to determining and understanding climate sensitivities to solar forcing.



The agenda for this interactive meeting consists of invited and contributed oral and poster presentations concerning variations in the Sun's radiation and in the Earth environment. We will discuss the utilization of improved solar irradiance measurements and models, such as being developed by SORCE, to help advance climate and atmospheric models, in conjunction with ongoing Earth Science measurements. We encourage your participation and hope that you will join us. Registration materials will be available in the fall, but mark your calendar today!

Key questions to be addressed and tentative sessions are posted on the 2008 SORCE Science Meeting web site: <http://lasp.colorado.edu/sorce/2008scimeeting>. We hope to begin posting invited speakers in late July.

## ***Upcoming Meetings / Talks –***

***SORCE scientists plan to present papers or attend the following 2007 meetings:***

IUGG – July 2-13, Perugia, Italy

SPIE – Optical and Photonics, August 28-30,  
San Diego, CA

CALCON, Conference on Characterization and  
Radiometric Calibration for Remote Sensing,  
Sept. 10-13, Logan, UT

AGU Fall Meeting, Dec. 10-14, San Francisco, CA

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