



## *2012 SORCE Science Meeting –*

### *Models of Spectral Irradiance Variability: Origins in the solar atmosphere and impacts on Earth's atmosphere*

*Sept. 18-19, 2012 ♦ Annapolis, MD*

**Abstracts Due: June 29**

**Join us & submit yours today!**

The 2012 Solar Radiation and Climate Experiment (SORCE) Science Meeting examines modeling efforts to understand solar spectral irradiance (SSI) variability, in terms of both its origins in the solar atmosphere and its impact on Earth's climate and atmosphere. In solar physics, advancements in radiative transfer, surface feature identification, dynamics and how observations of solar magnetic fields and irradiance all lead to an improved understanding of the mechanisms of irradiance change. Earth-atmospheric general circulation models (GCM) incorporating sophisticated codes for chemistry, radiation, dynamics, and feedback mechanisms associated with clouds, aerosols, and ocean processes are able to address the role of SSI variability in climate. In both cases, comparisons with observations lead to a deeper understanding of the dynamic solar atmosphere and our complex Earth climate system.

The 2012 SORCE Meeting is jointly sponsored by the NASA GSFC / CU LASP Sun Climate Research Center Symposium.



*Four sessions are organized around the following key science questions:*

- Development of three dimensional models of the solar atmosphere are rapidly progressing; how will these models further our understanding of the radiative properties of the solar atmosphere relative to static one dimensional models?
- Do small scale processes on the Sun scale to give irradiance variability, and do they give a reasonable explanation of changes that can occur on decadal or centennial scales that relate to climate change?
- Does incorporating SSI data into GCM's improve the prediction skills of these models, and do different models produce similar results with the same solar input?
- For both solar models and GCM's how well do model predictions agree with observations over decadal time scales? In the case of solar physics, long-standing irradiance observations as well as findings from solar image analysis and magnetograms can be employed. Likewise, Earth observing satellites and ground-based observations provide valuable data on the distribution of fundamental atmospheric components such as temperature, trace species, and wind fields.

### **Call for Abstracts**

The agenda for this 2-day meeting consists of invited and contributed presentations. We encourage your participation and hope that you will share this announcement with colleagues. Please submit your abstract (250 words max) to Vanessa George via email ([vanessa.george@lasp.colorado.edu](mailto:vanessa.george@lasp.colorado.edu)). Please include your affiliation and which session you prefer your presentation.

More information regarding submitting an abstract is at: <http://lasp.colorado.edu/sorce/news/2012ScienceMeeting/abstracts.html>.

**Important Deadlines:**

**Abstracts Due: June 29**

**Pre-Registration: August 17**

**Lodging Cut-off: August 17**

## **Confirmed Speakers (as of 6/20/2012)**

The speakers are given in alphabetical order within each session and with tentative titles:

### **Session 1 – Modeling of the Solar Atmosphere with Emphasis on Spectral Irradiance**

**Phil Chamberlin**, NASA GSFC, Greenbelt, MD  
*FISM UV Proxy Model*

**Juan Fontenla**, NorthWest Research Assoc., Boulder, CO  
*Solar Radiation Physical Modeling (SRPM) of SSI*

**Judith Lean**, NRL, Washington, DC  
*NRL's Photospheric Proxy Model*

**Regner Trampedach**, JILA, Univ. of Colorado-Boulder  
*3D modeling Emphasis on Chromosphere*

**Han Uitenbroek**, NSO, Sacramento Peak, NM  
*Needs for Special Spectral Modeling*

### **Session 2 – Modeling of the Solar Influence on Earth Climate**

**Sarah Ineson**, Met Office, Exeter, Devon, UK  
*Top-down Solar Influence, NAO*

**Charles Jackman**, NASA GSFC, Greenbelt, MD  
*Influence of Large Solar Proton Events on the Atmosphere*

**Cora Randall**, LASP, Univ. of Colorado-Boulder  
*Influence of Energetic Electron Precipitation on the Atmosphere*

**Bill Swartz**, John Hopkins University, APL  
*NASA Goddard GEOS Model Studies*

### **Session 3 – Observations of Solar Spectral Irradiance Variability**

**Linton Floyd**, Interferometrics Inc., Herndon, VA  
*SUSIM Analysis*

**Scott McIntosh**, HAO, NCAR, Boulder, CO  
*Irradiance Trends and the Open Magnetic Field*

**Dora Preminger**, SFO, California State Univ., Northridge  
*Solar Image Analysis at San Fernando Observatory*

**Doug Rabin**, NASA GSFC, Greenbelt, MD  
*Infrared Irradiance and Sun-like Stars*

### **Session 4 – Observations of the Solar Influence on Earth Climate**

**Ralph Kahn**, NASA GSFC, Greenbelt, MD  
*Aerosol Impacts on Earth's Energy Budget*

**Aimee Merkel**, LASP, Univ. of Colorado-Boulder  
*Upper Atmospheric Ozone and WACCM*

**Sebastian Schmidt**, LASP, Univ. of Colorado-Boulder  
*Aircraft Measurements of Atmospheric Radiance*

**Dong Wu**, NASA GSFC, Greenbelt, MD  
*MLS Comparison with Atmospheric Models*

~ **Please join us!** ~

## **2012 SORCE Meeting Venue**

We will be meeting at the *Historic Inns of Annapolis*, a refreshing mix of Victorian charm and modern convenience. Located in the Annapolis Historic District, this boutique hotel (3 distinct beautifully restored properties) is within walking distance (10 minutes) of Annapolis's main attractions. Enjoy a stroll down cobblestone streets to waterfront restaurants, quaint shops, lively pubs, and take in the area's history.

Hotel reservation information will be posted online soon, and it will include special rate information (\$116/night) for the SORCE Meeting. For more information on the Historic Inns of Annapolis, visit:

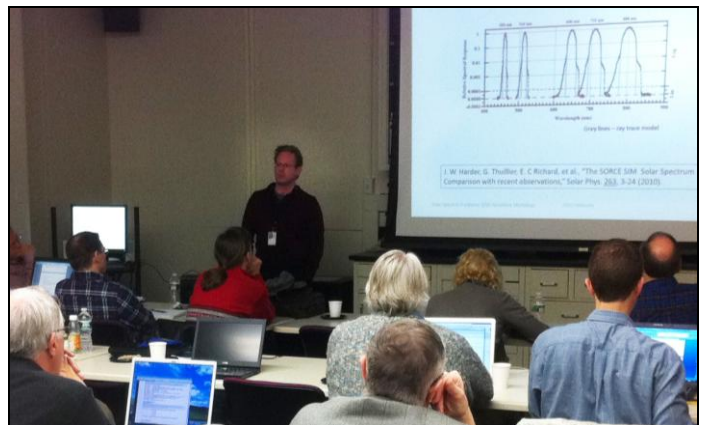
<http://www.historicinnsofannapolis.com/>

### **2012 SORCE Meeting**

<http://lasp.colorado.edu/sorce/news/2012ScienceMeeting/>

## ***SSI Variations Workshop –***

There was a small gathering of scientists and calibration specialists that met Feb. 28 – March 1 at NIST in Gaithersburg, Maryland, to address the interesting and conflicting differences for the reported solar spectral irradiance (SSI) variations reported during the SORCE Mission and other missions. SORCE science team members in collaboration with NIST and NASA GSFC professionals met with other SSI instrument teams and calibration experts to examine these discrepancies by focusing on issues primarily related to understanding degradation trends that affect the measurement of solar cycle variations in irradiance. For more information on this workshop, please see the Workshop Summary post on the SORCE website at: <http://lasp.colorado.edu/sorce/workshops/index.htm>

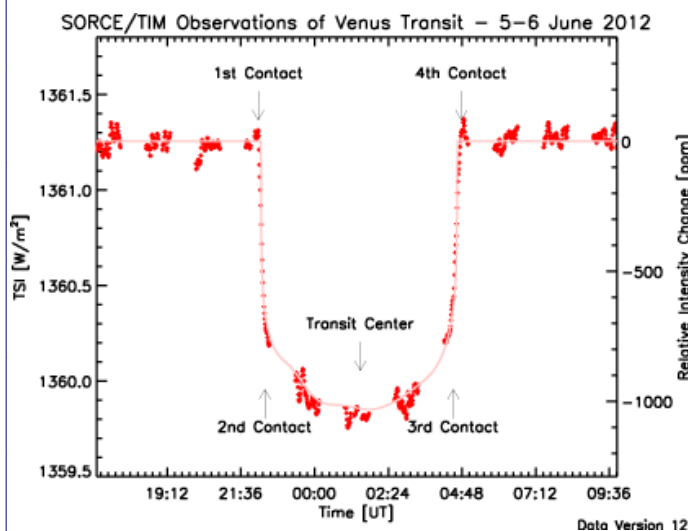


Allan Smith from NIST (National Institute of Standards and Technology) discussed "Capabilities of NIST SIRCUS Calibrations for SSI Vis-IR Instruments" on the second day of the SSI Variations Workshop. (Photo credit: Marty Snow)

# Total Irradiance Observations of the Venus Transit –

By Greg Kopp, LASP, Univ. of Colorado

The Total Irradiance Monitor (TIM) on *SORCE* has a precision of approximately 0.0004%, or 4 parts per million (ppm), so it can detect very small fluctuations in the Sun’s spatially-integrated radiant output as needed for monitoring long-term solar variability. With this extremely high level of sensitivity, normal solar fluctuations over a few minutes of ~50 ppm due to solar convection and oscillations are readily apparent, as are larger (~1000 ppm), longer-duration changes due to sunspots and faculae.



The 5-6 June 2012 Venus transit was therefore unmistakable in the plotted TIM measurements (red dots). In excellent agreement with predictions (faint red curve) based on the positions of *SORCE*, Venus, and the Sun, the incident sunlight decreased by 1000 ppm during the transit, making it comparable to a medium sized sunspot. The plotted TIM’s total solar irradiance data show a decrease from the Sun’s current normal value of 1361.25 W/m<sup>2</sup> down to 1359.85 W/m<sup>2</sup> at the center of the 6 hr 37 minute transit. The decreasing brightness nearer transit center is due to the Sun being brighter near disk center than at the edges, thus meaning Venus blocks out more light when nearer disk center. This limb darkening effect was included in the predicted light curve in the plot. The aforementioned small fluctuations in solar brightness on short time scales from solar convection and oscillations can be seen in measurements both before and after the transit. Gaps in the shown data are from times when the *SORCE* spacecraft was in the Earth’s shadow and could not view the Sun; great (albeit slightly fortuitous) planning on the part of *SORCE* Mission Operations meant that all four contacts for this rare Venus transit were observed!

Exo-solar planets are being discovered via transits in front of their stars using similar light curve measurements.

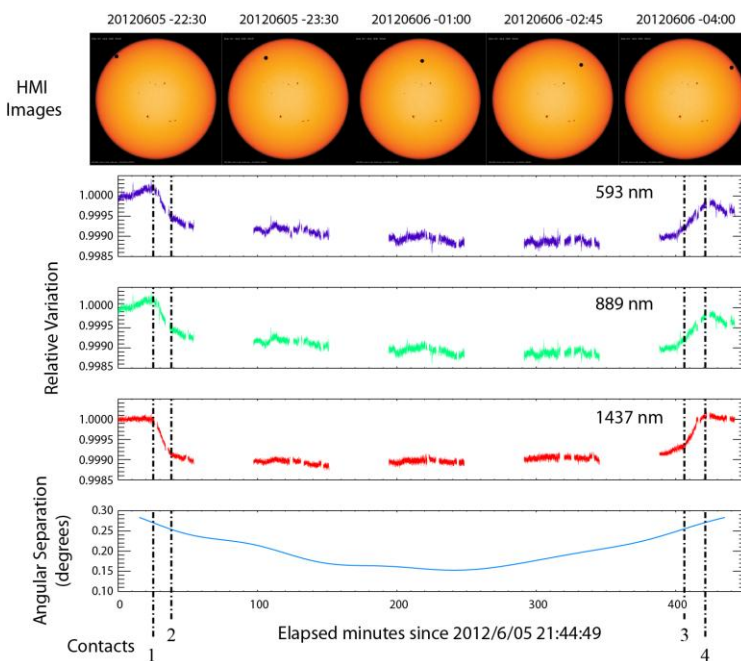
While Venus shows a 1000 ppm decrease when transiting the Sun as viewed from the Earth’s relatively close vantage point, when viewed from another star system this Venus transit – or that of any Earth-like planet – would appear as a mere 80 ppm decrease. Superposed on that signal are the previously mentioned solar fluctuations of ~50 ppm from which the transit must be distinguished; such are the difficulties that are being overcome by exo-solar planet discovery experiments such as NASA’s Kepler mission.

The shown TIM Venus transit plot and more details of Venus and Mercury transits viewed by the TIM can be found at <http://spot.colorado.edu/~kopp/TSI>.

# SIM Sees Venus Transit –

By Jerry Harder, LASP, Univ. of Colorado

SIM A observed the Venus transit in a fixed wavelength mode with the hard radiation trap in place to minimize prism degradation over the ~7.5 hour period of the transit. The position of the instrument’s prism drive was selected so the Vis1, Vis2, and IR photodiodes can record the event simultaneously. Because the SIM instrument is now in a power cycling mode to conserve power, additional temperature corrections were applied to remove any thermal bias in the time series. All four Venus-Sun contact points were observed at 593 nm (Vis1), 889 nm (Vis2), and 1437 nm (IR) with a respective signal-to-noise ratio of 14400, 22900, 12000 per 0.1 second integration time; simple data smoothing, as seen in the plot, increases the SNR even further. For reference the Sun-Venus angular separation is shown in the bottom plot. The top panel shows the progression of Venus across the Sun as seen by the SDO HMI instrument. For more information about HMI, please see <http://jsoc.stanford.edu/>.





## ***SORCE Sponsors Solar Teacher Workshop –***

*By Marty Snow, LASP, Univ. of Colorado*

### ***Who teaches the teachers? SORCE does!***

As part of the Extended Mission's Education and Public Outreach program, Erin Wood of LASP conducted a workshop for high school science teachers on the Sun and climate. A dozen teachers from around Colorado came to LASP for a three-day workshop to learn more about SORCE science. The first day of workshop included lectures on the solar cycle from SORCE scientist Marty Snow. The teachers also gained experience on lab exercises which they could use in their classrooms. The labs involved using magnets to create different shaped magnetic fields and looking at magnetograms to understand the evolution of the Sun's magnetic field over the course of the solar cycle.

The second day of the workshop was held at the National Center for Atmospheric Research (NCAR). Randy Russell led the teachers through a series of exercises describing the interaction of the Sun with the Earth's atmosphere and magnetosphere. NCAR's facility includes a museum of solar and climate science, and the teachers had a guided tour of the solar displays.

The final day of the workshop was combined with the first day of LASP's Research Experience for Undergraduates (REU) program. On this day the students and teachers learned about the big-picture interaction between the Sun and the Earth, plus a presentation on space weather by William Murtaugh from NOAA's Space Weather Prediction Center. Space weather is a name given to the short term interaction between the Sun and Earth which includes solar flares, coronal mass ejections, and bursts of energetic particles from the Sun. The teachers will be able to take an increased understanding of the science related to the SORCE mission back to the classroom in the coming year.



LASP Education Coordinator Erin Wood leads the discussion at the SORCE solar summit for teachers. (Photo credit: Marty Snow)

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## Hits to the SORCE Website

(Since 4/21/03, As of 05/04/12)

### ***Busy With Meetings –***

The last few months have been a blur with many interesting meetings for the SORCE scientists at LASP. Greg Kopp facilitated an ***ISSI Working Group – An Assessment of the Accuracies and Uncertainties in the TSI Climate Data Record***, March 6-8, in Bern Switzerland. Later in March was the annual ***Boulder Solar Day***, which is a one-day informal gathering for the Boulder, Colorado, solar community to share their research on instrumentation, observations, and models. Participating local institutes included NWRA, CU, HAO, LASP, NCAR, NOAA, and SwRI, as well as visitors from NSO and other solar institutes. Marty Snow participated in the ***Comet Lovejoy Workshop***, March 21-22, where they discussed recent observations of several sungrazing comets. These comets orbit close enough to the Sun to actually pass through the corona. In April the ***EGU 2012 General Assembly*** met in Vienna, Austria, where Tom Woods was invited to speak in a special session called "Impact of solar and geomagnetic variabilities on the Earth's lower, middle, and upper atmospheres". Marty Snow also attended the EGU Assembly and gave a talk on the polarization of the lunar irradiance observed by SORCE SOLSTICE. From Vienna, Marty went to Brussels, Belgium, for a workshop on ***On-Orbit Degradation of Solar and Space Weather Instruments***.



### ***Upcoming Meetings / Talks –***

*SORCE scientists plan to present papers or attend the following 2012 meetings/workshops:*

Intl. Radiation Symposium (IRS2012), Aug. 6-10,  
Berlin, Germany

CALCON Conference, Aug. 27-30, Logan, Utah

**SORCE Science Meeting, Sept. 18-19,**  
Annapolis, Maryland

SDO EVE Conference, Oct. 30-Nov. 1, Yosemite, Cal.

Intl. AGU Chapman Conference, Ethiopia, Nov. 11-17

Fall AGU Meeting, Dec. 3-7, San Francisco, Cal.

# SORCE