



2009 *SORCE* Science Meeting –

The Impact of Solar Variability on Earth

July 19-29 ☀ Montreal, Canada

Registration Deadline:
May 31, 2009

Hotel Deadline: June 17, 2009

The 2009 *SORCE* Science Meeting will be held in conjunction with the IAMAS 2009 Meeting in Montreal, Canada, July 19-29. There will be a special 2-day *SORCE*-related session (M03) called “*The Impact of Solar Variability on Earth*” on Monday-Tuesday, July 27-28.

For Session M03 details, visit the *SORCE* website: <http://lasp.colorado.edu/sorce/news/2009ScienceMeeting/index.html>.

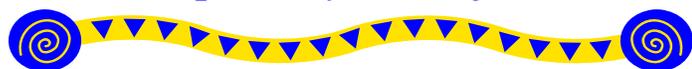
For general IAMAS 2009 meeting information and science program, visit:

<http://iamas-iapso-iacs-2009-montreal.ca/index.asp>.

As of June 2, abstracts for all MOCA-09 oral and poster presentations are available online through the Assembly’s Program Details and Session Planner. Visit www.moca-09.org/e/02-planner_e.shtml to plan your personal schedule.

Following Session M03 on **Monday, July 27**, there will be a **group science dinner** at a location to be determined (near the Convention Center) for anyone interested. When the location is finalized, information will be posted on the *SORCE* website. Attendees will be on their own for the dinner expense. Details will be available at the session and pre-registration will *not* be required, although people will need to RSVP on that Monday morning.

We hope that you will join us!



EGU General Assembly and ESA Solar EUV-IR Validation Workshop Summaries –

The *EGU (European Geosciences Union)* gathering in Vienna, Austria, April 19-24, involved about 9000 geoscientists covering all disciplines of the Earth, Planetary and Space Sciences. Sessions focused on current issues such as climate change, ocean acidification, the role of CO₂ in geological systems, CO₂ storage, pollution and health, renewable resources, and low-carbon energy options. They debated topics related to our natural environment and its current threats: geohazards such as wildfires, weather and climate. Spatial and temporal patterns of wildfires, models of desertification and degradation, and the realities of damage control in forest landscapes were covered in several sessions.



LASP attendees at the *EGU General Assembly* participated by giving several oral and poster presentations in an effort to share LASP’s research results with a broad international group of people. Invited talks included “*Accuracies of Incoming Radiation: Calibrations of Total Solar Irradiance Instruments*,” by Greg Kopp and “*The Solar Radiation and Climate Experiment (SORCE): Measuring the Sun’s Influence on Climate from Space*,” by Jerry Harder.

This meeting also provided an opportunity to enhance our collaborations with the solar, climate, and space weather communities. Of particular interest to the LASP solar scientists were several compelling talks about observations showing that the solar cycle 23 minimum is lower than the cycle 22 minimum has not been reached yet and that the minimum level in 2008 appears slightly lower than the 1996 minimum. The interaction with the international community provides valuable exposure of NASA’s current missions and data sets, as well as fruitful exchange of information to further advance our understanding of many complex issues concerning solar influence on Earth’s environment.

Prior to the *EGU Assembly*, the *SORCE* scientists participated in the *ESA Solar EUV-IR Validation Workshop* held at the Fraunhofer Institute for Physical Measurement (IPM) Techniques in Freiburg, Germany, April 15-17. This gathering of almost 35 international solar scientists is an important part of our solar irradiance programs because it

provides validation of solar measurements made in 2008 from LASP's TIMED and SORCE satellite instruments and from a rocket flight with the prototype SDO EVE instrument. Another important workshop objective was to validate measurements from the three SOLAR instruments on the International Space Station (ISS). The LASP instruments were compared with the observations from SOL-ACES, SOLSPEC, and SOVIM. Attendees discussed solar science results in the EUV, UV, Visible, NIR, and TSI. Collaborating with the international community to cross-validate solar irradiance measurements is imperative for maintaining long-term records. General workshop topics/goals included:

- Calibration discussion on space instrumentation and validation
- WHI Solar Irradiance Spectra (SIRS) from the April 2008 campaign and development of an irradiance data base for solar minimum conditions
- Development of an irradiance data base for solar active minimum conditions
- TSI measurements and analysis
- Modeling of the solar spectral irradiance
- Irradiance indices for solar and solar-terrestrial relation modeling and their applications
- Solar variability in the transition region as a function of temperature to be derived by inter-comparisons of data

The workshop began with several general overview talks to familiarize everyone with the workshop purpose (bulleted items above) and to provide the necessary background information to more thoroughly explore these topics. The overview was followed by attendees breaking into three working groups to address instrument calibration and spectral details. The splinter groups and their discussion tasks were:

1. TSI: Validation, long-term variations, modeling of spectral irradiance
2. IR-UV: Comparisons and reference spectra
3. EUV: Validation, calibrations, and reference spectra



The meeting continued by bringing everyone back together to report on their splinter group discussions. The rocket SDO EVE, TIMED SEE, and ISS SOL-ACES showed good agreement overall. The main differences were related to higher order corrections in the SOL-ACES above 34 nm and scattered light corrections for TIMED SEE EGS near 70 nm and in the 27-38 nm region. The comparisons of SORCE SIM, SORCE SOLSTICE, and ISS SOLSPEC showed very good agreement below 1000 nm. There are larger differences between 1000 and 3000 nm. The difference to the previous ATLAS SOLSPEC reference spec-

trum was as large as 8% near 1800 nm. More extensive analysis is needed for the IR region.

SORCE scientists participating in this workshop included Tom Woods (SORCE PI), Jerry Harder (LASP SORCE Project Scientist), Greg Kopp, Marty Snow, Bill McClintock, Margit Haberreiter, and Claus Fröhlich. Several special presentations included solar-stellar flux-flux relations; TSI, SSI, and SRPM modeling; EUV indices; solar variability; and the solar irradiance reference spectrum (SIRS). The workshop concluded by summarizing the achievements to date and discussing future plans for solar EUV-IR calibrations. They intend to have a follow-up workshop in 2010 to build upon their current inter-comparisons when more solar measurements are available from the ISS SOLAR instruments.

1,037,591

Hits to the SORCE Website

(Since 4/21/03, As of 5/22/09)

2009 SORCE Team Publications –

Jerry Harder published “Trends in solar spectral irradiance variability in the visible and infrared” in *Geophysical Research Letters*, vol. 36, L07801, doi: 10.1029/2008GL036797, 2009. Co-authors on the SORCE team include Juan Fontenla, Peter Pilewskie, Erik Richard, and Tom Woods. The final paper is available at: <http://www.agu.org/journals/gl/gl0907/2008GL036797/008GL036797.pdf>.

Abstract: The Spectral Irradiance Monitor (SIM) onboard the Solar Radiation and Climate Experiment (SORCE) satellite provides the first multi-year continuous measurements of solar spectral irradiance (SSI) variability from 200–2400 nm, accounting for about 97% of the total solar irradiance (TSI). In addition to irradiance modulation from active region passage, the SSI values for wavelengths with a brightness temperature greater than 5770 K show a brightening with decreasing solar activity, whereas those with lower brightness temperatures show a dimming. These results demonstrate that different parts of the solar atmosphere contribute differently to the TSI with the behavior in the deep photospheric layers giving an opposing and nearly compensating trend to that in the upper photospheric and lower chromospheric layers. These findings need to be incorporated into Earth-climate assessments since the solar forcing induced by these differential trends

are inherently different from the relatively flat spectral contributions employed in the IPCC assessments.

Tom Woods published “Solar Irradiance Reference Spectra (SIRS) for the 2008 Whole Heliosphere Interval (WHI)” in *Geophysical Research Letters*, vol. 36, L01101, doi: 10.1029/2008GL036373, 2009. *SORCE* co-authors include Jerry Harder, Marty Snow, Juan Fontenla, Bill McClintock, and Erik Richard. The complete paper is at: <http://www.agu.org/journals/gl/gl0901/2008GL036373/008GL036373.pdf>.

Abstract: The IHY2007 Whole Heliosphere Interval (WHI) for solar Carrington Rotation 2068 (20 March to 16 April 2008) has been very successful in obtaining a wide variety of solar, heliospheric, and planetary observations during times of solar cycle minimum conditions. One of these efforts is the generation of solar irradiance reference spectra (SIRS) from 0.1 nm to 2400 nm using a combination of satellite and sounding rocket observations. These reference spectra include daily satellite observations from TIMED Solar Extreme ultraviolet Experiment (SEE) and Solar Radiation and Climate Experiment (*SORCE*) instruments. The extreme ultraviolet range is also improved with higher spectral resolution observations using the prototype SDO Extreme ultraviolet Variability Experiment (EVE) aboard a sounding rocket launched on 14 April 2008. The SIRS result is an important accomplishment in that it is the first data set to have simultaneous measurements over the full spectral coverage up to 2400 nm during solar cycle minimum conditions.

Juan Fontenla has an article in press called “Solar irradiance forecast and far-side imaging” at *Advances in Space Research*.

Abstract: This paper presents a new approach to forecasting short-term *Lya* solar irradiance variations due to the presence and evolution of magnetically heated regions in the Sun’s outer atmosphere. This scheme is based on images of the solar disk at key wavelengths, currently Ca II K filtergrams, maps of backscattered solar *Lya* from the interplanetary medium, and helioseismic images of large far-side active regions. The combination of these resources allows accurate forecasts of the UV solar irradiance several days in advance. The technique takes into consideration the evolution of recently observed activity on the Sun’s near surface as well as active regions on the Sun’s far side. The far-side helioseismic maps and the *Lya* backscattering are very important, because of the long period of time features spend on the Sun’s far side compared with their typical evolution time and their relatively sudden appearance on the near side. We describe the basics of the forecasting technique and apply it to a case study that shows how the technique dramatically improves *Lya* irradiance forecasting. An extension of the technique described here promises realistic forecasts of the entire FUV/EUV solar spectral irradiance spectrum.

Upcoming Meetings / Talks – SORCE scientists plan to present papers or attend the following 2009 meetings:

- ISSI Working Group – Cross-calibration of past FUV Experiments, May 25-28, Bern Switzerland
- AAS/Solar Physics Division Meeting, June 14-18, Boulder, Colorado
- IAMAS/APSO – *SORCE* Meeting, July 19-29, Montreal, Canada
- SOHO-23: Understanding a Peculiar Solar Minimum, Sept. 21-25, Northeast Harbor, Maine
- ISSI Working Group – Tools for UV Calibration, September, Bern Switzerland

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~~ Tentative ~~
2010 *SORCE* Meeting
May 5-7, 2010
Colorado High Country