



## 2006 *SORCE Science Meeting* Tentative Agenda –

**September 20-22**  
**San Juan Islands, Washington**

Full meeting details including abstracts for this year's *SORCE Meeting*, *Earth's Radiative Energy Budget Related to SORCE*, are available at:

<http://lasp.colorado.edu/sorce/2006ScienceMeeting/>.

Between the great science program and the magnificent setting, you won't want to miss the 4<sup>th</sup> Annual *SORCE Science Meeting*!

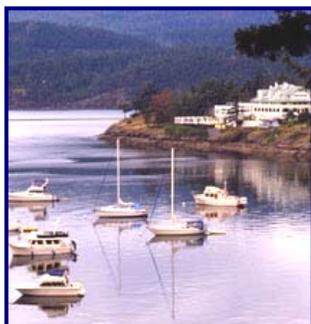
### Tentative Meeting Agenda (as of 8/29/06)

#### Tuesday, Sept. 19

5:30 p.m. Welcoming Reception

#### Wednesday, Sept. 20

8:30 a.m. Welcome



### Session 1. *SORCE Contributions to Earth's Radiative Energy Budget*

- ▶ **Tom Woods**, *Overview of the SORCE Mission and Its Future*
- ▶ **Greg Kopp**, *TSI: The Incoming Side of the Equation*
- ▶ **Jerry Harder**, *The Role of VIS-IR / SIM in Climate Science*
- ▶ **Bill McClintock**, *The Role of UV / SOLSTICE in Climate Science*
- ▶ **Marty Snow**, *The Role of Spectral Resolution in Measuring the Solar Magnesium II Index*

### Session 2. *Radiative Energy Budget*

- ▶ **Norm Loeb**, *Determination of the Earth's Radiation Budget from CERES*
- ▶ **Bruce Wielicki**, *Earth's Radiation Budget from Space*
- ▶ **Peter Pilewski**, *Overview of the Radiation Budget in the Lower Atmosphere*
- ▶ **V. Ramanathan**, *How do Aerosols and Clouds Regulate the Planetary Albedo and the Solar Radiation Budget?*

- ▶ **Ellsworth Dutton**, *Surface Radiation Budget Observations: Progress and Challenges*
- ▶ **Tom Ackerman**, *The Radiation Budget of an Atmospheric Column in the Tropical Western Pacific*
- ▶ **Roger Davies**, *Constraints on the Interannual Variation of Global and Regional TOA Radiation Budgets Inferred from MISR Measurements*
- ▶ **Steven Dewitte**, *Time-Space Complete Measurement of the Earth Radiation Budget*
- ▶ **Tony Slingo**, *Observations of the Earth's Radiation Budget from Geostationary Orbit and from the Surface*
- ▶ **Xunmin Shen**, *The FY-3 Earth Radiation Measurement Instrument Design and Calibration*

### 4:30 p.m. Poster Sessions/Reception

- ▶ **Antony Clarke**, *Biomass Burning and Pollution Aerosol over North America: Organic Components and Their Influence on Spectral Optical Properties and Humidification Response*
- ▶ **Dominique Crommelynck**, *The Observation of the Earth Radiation Budget: A Set of Challenges*
- ▶ **Matt Deland**, *Composite Solar UV Time Series for the 21st Century*
- ▶ **Chang-Yun Fan**, *Effect of Solar Wind on Ecosystem*
- ▶ **Claus Froehlich**, *Comparison of the WRC-85 Solar Spectral Irradiance with RSSV1 and the SPM of VIRGO/SOHO*
- ▶ **Barry Knapp**, *SORCE Solar Irradiance Data Products*
- ▶ **Greg Kopp**, *Could You See an Earth-Type Planetary Transit of a Solar-Type Star? Another Use of TIM Data*
- ▶ **Robert Kurucz**, *High Resolution Irradiance Spectrum from 300 to 1000 nm*
- ▶ **Jeff Morrill**, *A Model of Long-Term Variability of Solar UV and EUV Irradiance*
- ▶ **Julia Saba**, *Rapid Solar Cycle Onset – Potential New Climate Study Tool?*
- ▶ **Marty Snow**, *The LASP Interactive Solar Irradiance Database (LISIRD)*
- ▶ **Mark Weber**, *Solar UV/Vis/NIR Spectral Irradiance from SCIAMACHY and GOME*
- ▶ **Guoyong Wen**, *Deriving Historical TSI Variations from Lunar Borehole Profiles*



Thursday, Sept. 21

**Session 3. Radiative Forcings – Dedicated to Yoram Kaufman**

- ▶ **Robert Cahalan**, *Tribute to Yoram Kaufman*
- ▶ **Judith Lean**, *Solar Radiative Forcings*
- ▶ **Roger Pielke Sr.**, *Regional and Global Climate Forcings – The Need to Move Beyond a Focus of the Radiative Forcing of the Well-Mixed Greenhouse Gases*
- ▶ **Mark Weber**, *Solar Variability and its Links to Ozone-Climate Interaction*
- ▶ **Bill Collins**, *Radiative Forcing by Greenhouse Gases and its Representation in Global Models*
- ▶ **Brian Cairns**, *Using Models and Measurements to Understand and Constrain the Direct Effect of Aerosols on Climate*
- ▶ **Jim Coakley**, *The Aerosol Indirect Effect*
- ▶ **Antony Clarke**, *An Ultrafine Sea-Salt Flux from Breaking Waves: Implications for CCN in the Remote Marine Atmosphere*
- ▶ **Steven Lloyd**, *A 27-Year Composite Dataset of Global UV Effective Reflectivity from the TOMS and SBUV(2) Satellite Instruments*

**Session 4. Climate Responses and Feedbacks**

- ▶ **Graeme Stephens**, *A Solar Radiation Perspective on Cloud-Climate Feedback*
- ▶ **KK Tung**, *Climate Sensitivity from Atmosphere's Response to the Radiative Forcing of the 11-Year Solar Cycle, including Feedbacks*
- ▶ **Steve Rumbold**, *Effect of the 11-Year Solar Cycle on Stratospheric Temperatures*
- ▶ **David Halpern**, *Atmosphere-Ocean Interfaces in Climate*

**3:45 p.m. Ferry to San Juan Island**

**6:30 p.m. SORCE Science Dinner,  
San Juan Island Yacht Club**

**Guest Speaker – Gary Rottman**

Friday, Sept. 22

**Session 4 continues**

- ▶ **Robert Cahalan**, *Three-Dimensional Cloud Properties and Climate*
- ▶ **Subarna Bhattacharyya**, *A Wavelet Cross-Spectral Analysis of Solar/ENSO Connections with Indian Monsoon Rainfall*
- ▶ **Ken Jezek**, *The Ice Feedback*
- ▶ **Jose Rial**, *Solar Forcing and Abrupt Climate Change over the Last 100,000 Years*
- ▶ **EJ Zita**, *Earth's Energy Balance: Climate Change Workshops*

**11:00 a.m. Meeting Overview**

**12:00 noon Adjourn**

**1:30 p.m. Nature/Whale Watching Tour departs**

**SORCE Sponsors SSI & Climate Modeling Workshop**

*By Peter Pilewski, LASP, University of Colorado*

The LASP SORCE science team hosted a one-day workshop in Boulder, Colorado on August 9 2006, entitled **Solar Spectral Irradiance (SSI) and Climate Modeling**. Approximately 40 people attended, primarily from the University of Colorado, NCAR, and NOAA, but also represented were Naval Research Laboratory (NRL), Jet Propulsion Laboratory (JPL), and Atmospheric and Environmental Research, Inc. (AER).

The solar Spectral Irradiance Monitor (SIM) on SORCE is currently providing the very first continuous observations of the Sun's ultraviolet, visible and near infrared spectrum with sufficient precision to characterize true solar variations. The measurements enable detailed quantification of the solar radiation that produces the variations in total solar irradiance, monitored from space since 1978. This characterization, not possible before the launch of SORCE, is the basis for new understanding of the solar spectral variability needed for input to a variety of climate and atmospheric models and for reconstructing solar spectral irradiance variations prior to the SORCE mission.

A primary workshop goal was promotion of the SORCE measurements of SSI and its variability for use by scientists in the climate, chemistry and radiative transfer communities. It is well known that the greatest *relative* variability in the solar spectrum occurs in the ultraviolet spectrum: however the largest energy changes occur at longer wavelengths. Thus a high priority for the workshop was variability of the full solar spectrum (0.2 to 2 micron), together with the climate processes and mechanisms of climate response to these variations. By fostering new interactions between the climate and atmospheric modeling communities and the SORCE science team, we ultimately aim to improve understanding of physical processes that generate a multitude of reported empirical Sun-Climate connections. From a practical standpoint, user communities gained a better understanding of the available SORCE SSI data, their format, cadence, sampling and spectral resolution, precision, and accuracy. Conversely, the SORCE team gained a better understanding of current and future user community needs and applications.

Tom Woods, SORCE Principal Investigator, opened the workshop with a SORCE status report. The SORCE spacecraft was launched on January 25, 2003 and the mission is

**240,075**

**Hits to the SORCE Website**

*(Since 4/21/03, As of 8/28/06)*

currently funded until January 2008. Following next year's Senior Review, SORCE could be extended an additional 4 years. Tom emphasized the risk of potential gaps in SSI (beyond SORCE) and TSI (beyond Glory), even if the SORCE mission extends to 2012.

Jerry Harder, SORCE LASP Program Scientist and SORCE Spectral Irradiance Monitor (SIM) Instrument Scientist, and presented an overview of SORCE SSI measurements. Jerry stressed the need for a highly accurate absolute solar spectrum and discussed the links between solar variability and the Earth's climate. He presented examples of SORCE 27-day (solar rotation) variability, from SOLSTICE and SIM, longer-term variability (mean variance in spectral irradiance over a 60-day period), and simulations of differential instantaneous spectral heating rates between active and quiet solar conditions.

Alexander Ruzmaiken from JPL, and a regular contributor to SORCE's annual Science Team Meetings, illustrated the utility of Empirical Mode Decomposition (EMD) for potentially linking modes of solar variability with those of climatically significant variables such as ozone concentration and temperature. Advantages of EMD over other methods include better handling of non-stationarity and nonlinearity and no "leakage" between modes.

Judith Lean, a member of the SORCE Science Team from NRL in Washington, DC, provided an overview of models of total and spectral solar variability, and gave several examples of applications in climate and atmospheric chemistry. As an example, the solar spectra in 203 bands from 0.121 to 0.859 micron are needed daily by AutoChem (Fig. 1, developed by David Lary). In

describing the broad user community of SSI, Judith set the stage for subsequent talks and stimulated discussions of user requirements and also discussed improvements in her new spectral irradiance model and comparisons with SOLSTICE and SIM observations (Fig. 2).

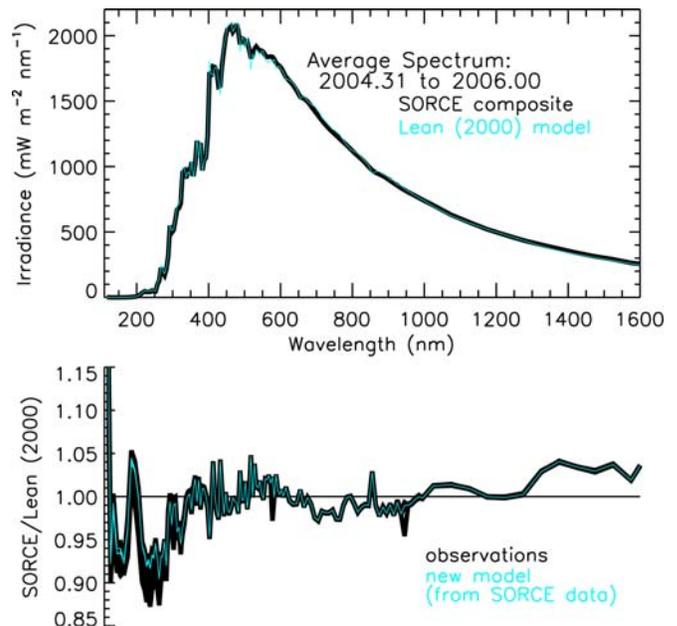
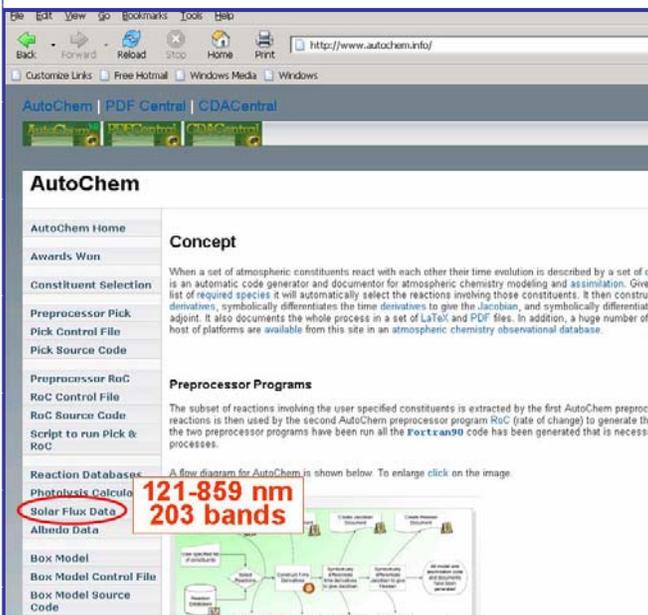


Fig. 2 Models of solar spectral irradiance variations currently used as input for some climate and atmospheric studies are being validated and improved using the SORCE SIM observations.

Three talks addressed specific coupled climate models, Whole Atmosphere Community Climate Model (WACCM), Hamburg Model of the Neutral and Ionized Atmosphere (HAMMONIA), and the Goddard Institute for Space Studies (GISS) Model, presented by Dan Marsh, NCAR, Hauke Schmidt, Max Planck Institute, and Judith Lean, NRL (for David Rind, GISS), respectively. Each speaker provided model details, including spectral range and resolution for the radiation modules and how solar irradiance is input into the models. For example, GISS has a suite of atmospheric and ocean general circulation models which require as input the solar spectral irradiance in 190 wavelength bands between 0.115 and 100 microns. Solar spectra needed for input to WACCM include 11-year and 27-day spectrum variability in the ultraviolet, visible, and infrared; extended (100 year) SSI variability; high temporal resolution for flare studies; and spectral irradiance for historic periods such as the Maunder minimum.

Schmidt indicated that for HAMMONIA high resolution spectra are needed between 120 to 700 nm. At shorter wavelengths the F10.7 proxy will be used. Currently Judith Lean supplies model spectra with 1 nm spectral resolution and 1-day temporal resolution for the solar irradiance, which appears to be sufficient for most current applications. For long-term simulations of the recent past, data for several solar cycles will be required. Presently such simulations rely on solar models. Of interest are data with high



AutoChem is an example of an application of solar spectral irradiance daily data.

temporal resolution (~10 min.) to characterize terrestrial responses to solar eruptions of flares and solar proton events.

Jennifer Delamere (AER, Inc.) described high spectral resolution, shortwave radiative transfer in the Earth's atmosphere. AER builds radiative transfer models suitable for Earth's atmosphere and validates them using high-resolution *in situ* radiance and irradiance measurements. High resolution solar spectral irradiance over the complete spectral range from UV through far infrared is one of the key model inputs. AER seeks guidance from the solar irradiance community to provide a high accuracy reference spectrum that will ultimately be transferred into global climate and numerical weather prediction models.

Juan Fontenla, LASP, University of Colorado, described his Solar Radiation Physical Model (SRPM). Juan has produced a very high resolution quiet-Sun spectrum to be used by AER in their models and a similar set of spectra to be incorporated in MODTRAN at variable native MODTRAN resolution bins. SRPM includes seven different solar models and 10 quadrature angles to synthesize the solar spectrum based on PSPT imagery. SIM-measured irradiance is used to refine the model and set the absolute irradiance scale.

Marty Snow, LASP's PI of the LASP Interactive Solar Irradiance Datacenter (LISIRD), gave a brief review of LISIRD and the various products it serves. Snow provided an online demonstration and solicited the attendees to provide him with recommendations for data formats and composite (time/wavelength) products.

In summary, this initial SSI-Climate workshop established a forum to communicate to the climate and atmospheric science communities the available SORCE spectral irradiance data and to educate the SORCE science team on the variety of applications and future user needs. It is well recognized that deciphering the underlying mechanisms of climate response to solar variability relies on better representation of the atmosphere's dynamical, chemical, and radiative processes in models, part of which includes full spectral representation of solar variability. Progress toward this end will be achieved through coordinated efforts between the SORCE instrument science team and users of these data.

## ***Upcoming Meetings / Talks –***

***SORCE scientists plan to present papers or attend the following 2006 meetings:***

EUFAR (EUropean Fleet for Airborne Research) Workshop on Combining Satellite Missions and Aircraft Activities: Future Challenges for the EUFAR Fleet, Sept. 13-15, Paris, France

SORCE Science Meeting, Sept. 20-22, San Juan Islands, WA

Coimbra Solar Physics Meeting, "The physics of chromospheric plasmas," Oct. 9-13, Coimbra, Portugal

AGU Fall Meeting, Dec. 11-15, San Francisco, CA



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