



2015 Sun-Climate Symposium –

Our focus topic for this 3.5-day meeting is “*Multi-Decadal Variability in Sun and Earth during the Space Era.*” Sponsors are the SORCE mission and the Sun-Climate Research Center – a joint venture between NASA GSFC and LASP at the University of Colorado.

Call for Abstracts ☀ Due August 7

Observations of the Sun and Earth from space have revolutionized our view and understanding about impacts of solar variability and anthropogenic forcing on Earth climate. For more than three solar cycles since 1978, the total and spectral solar irradiance (TSI and SSI) and global terrestrial atmosphere/surface have been observed continuously, enabling unprecedented quality data for Sun-climate studies. The primary objective of this symposium is to convene climate scientists, solar physicists, and experimentalists together for a better understanding how Earth climate system changes and responds to solar variability.

Please note that the Sun-Climate Symposium is slightly longer than past SORCE Meetings since we have expanded our sponsorship and meeting theme. We will meet Tuesday morning through Friday noon, Nov. 10-13.

The agenda for this interactive meeting consists of invited and contributed oral and poster presentations. We have 8 sessions which fit under 3 theme topics. **Additional information on each of the sessions, the abstract form, and submittal instructions are available on the website.** We encourage your participation and hope that you will share this announcement. Please mark your calendar to join us for a great meeting in a beautiful location!

Nov. 10-13, 2015 * Savannah, GA
Meeting Website:

<http://lasp.colorado.edu/home/sorce/news-events/meetings/2015-sun-climate-symposium/>

Join us!
Click now to submit abstract!



Session and Confirmed Speakers:

(As of 7/14/2015, by session and then alphabetical. Presentation titles are online and abstracts will posted as they are received.)

1. Decadal Variability of the Sun and Sun-like Stars

1a) TSI Measurements and Modeling

Gary Chapman, *San Fernando Observatory, California State Univ., Northridge*

Odele Coddington, *LASP, Univ. of Colorado, Boulder*

Greg Kopp, *LASP, Univ. of Colorado, Boulder*

Kok Leng Yeo, *Max Planck Institute, Germany*

1b) SSI Measurements and Modeling

Gene Avrett, *Harvard-Smithsonian CfA, Boston, MA*

William Ball, *PMOD/WRC, Switzerland*

Jim Butler, *NASA GSFC, Greenbelt, MD*

Scott McIntosh, *High Altitude Observatory (HAO)/NCAR, Boulder, CO*

Gary Rottman, *LASP, Univ. of Colorado, Boulder*

Ken Tapping, *Canadian National Research Council, Herzberg Inst. of Astrophys., Penticton, BC*

1c) Variability of the Sun-like Stars

Tom Ayres, *CASA, Univ. of Colorado, Boulder*

Jeff Hall, *Lowell Observatory, Flagstaff, AZ*

Hugh Hudson, *Univ. of California – Berkeley/SSL*

Phil Judge, *HAO/NCAR, Boulder, CO*

2. Climate Change Theories and Observations

2a) Climate Changes during the Space Era

John Emmert, *Naval Research Lab., Washington DC*
Rolando Garcia, *Atmos. Chemistry/NCAR, Boulder, CO*
Norm Loeb (tentative), *NASA Langley, Hampton, VA*
Drew Shindell, *Duke University, Durham, NC*

2b) Societal Impacts from Climate Change and Solar Variability

Jason Evans, *Stetson University, DeLand, FL*
Dean Hardy, *University of Georgia, Athens*
Rosanna Rivera, *University of Georgia, Athens*
Bruce Wielicki, *NASA Langley, Hampton, VA*

2c) Sun-Climate Connection: Top-down and bottom-up couplings

Joanna Haigh (tentative), *Imperial College, London, UK*
Andrew Kren, *NOAA, Global Systems Div., Boulder, CO*
Anne K. Smith, *Atmos. Chemistry/NCAR, Boulder, CO*

3. Challenges and Opportunities for Future Solar and Earth Observations

3a) Next Generation Observing Systems for Climate Records

David Crisp, *NASA Jet Propulsion Laboratory, Pasadena, CA*
Sasha Marshak, *NASA GSFC, Greenbelt, MD*
Hank Revercomb, *University of Wisconsin – Madison*
Graeme Stephens, *NASA Jet Propulsion Laboratory, Pasadena, CA*
Cheryl Yuhas, *NASA Headquarters, Washington DC*

3b) Challenges and Opportunities in Solar Observations

Luc Damé, *LATMOS, France*
Erik Richard, *LASP, Univ. of Colorado, Boulder*
Marty Snow, *LASP, Univ. of Colorado, Boulder*

New OBC Flight Software –

Success! The *SORCE* flight operations team uploaded new onboard computer (OBC) flight software on May 28 to an unused memory bank. On June 2nd, the transition was successfully made to the new software. On June 2nd the new Attitude and Power Equipment (APE) flight software was uploaded and transitioned.



The new OBC and APE flight software will reduce the load on the spacecraft battery (approximately 10% are first estimates) and will allow for operations during brownout conditions. Specifically the new software will: 1) turn off the reaction wheels during spacecraft night, 2) improve the sunrise sequence, which will increase the science captured, and 3) make for an easier transition from brownout mode to continue collecting science. The Day Only Operations (DO-Op) mode implemented in February 2014 continues to the *SORCE* instruments to collect good solar measurements.

Fall AGU – Abstracts Due Aug. 5

Fall AGU Meeting, Dec. 14-18, San Francisco, CA

Abstract deadline: Wed., August 5th



You are encouraged to submit abstracts to the following Fall AGU Session:

 ***SH006: Solar Spectral Irradiance: Measurements, Models, and Proxies***

Session SH006 / Session ID# 8561: Solar Spectral Irradiance: Measurements, Models, and Proxies.

Conveners: Martin Snow (primary), Debi Prasad Choudhary, Janet Machol, and Tom Woods.

Session Description: We solicit contributions involving solar spectral irradiance measurements and models, including irradiance proxies. In addition to contributions using existing datasets, presentations on upcoming missions or data (re)analysis efforts will be welcome. There are several efforts underway to create long term irradiance composites, such as the European SOLID project, as well as teams recently created by the NASA Solar Irradiance Science Teams (SIST) opportunity. Therefore a session spanning the breadth of solar spectral irradiance science at AGU is timely.

Invited Presenters:

- Gary Chapman (CSUN) on improvements at the San Fernando Observatory
- Margit Haberreiter (PMOD) on the results of SOLID
- Odele Coddington (LASP) on solar irradiance climate data records
- Rodney Viereck (SWPC) on the solar irradiance observations at NOAA

AGU Fall Meeting Website:

<http://fallmeeting.agu.org/2015/>

SORCE Sr. Review Results In –

The NASA Earth Science Senior Review Report was recently released. **The review panel gave the SORCE Mission a very positive report with the recommendation to continue the SORCE mission for fiscal years 2016-2018. We are excited that Headquarters plans to fund SORCE at the over-guide level with continued operations into FY18 to operate with TSIS.** Some report highlights included:

- The SORCE data products were rated “high utility” meaning they are routinely used by national agencies and organizations, and their loss would have a measurable impact.
- Due to the SORCE Mission TSI and SSI measurements, the scientific merit/product maturity was rated as “very good.” Reviewers felt that the mission clearly addresses key components of NASA’s climate and solar physics missions.
- The panel noted that the SORCE instruments are functioning exceptionally well, and the SORCE team is commended for their success in keeping the mission functioning through numerous obstacles (aging batteries, star tracker issues, and reaction wheel problems).
- Due to battery concerns, SORCE’s technical risk rating was “medium-high”.
- The cost risks were rated “low”.

The review was in depth and very thoughtful, offering insights for mission improvements. In late August NASA Headquarters will provide FY16-FY18 budget guidelines for the extended mission.

SORCE REU Research Projects –

By Marty Snow, LASP, Univ. of Colorado

The University of Colorado’s Research Experience for Undergraduates (REU) 8-week summer program is well underway. Two of the students are funded by the SORCE mission to work on special research projects involving measurements from SORCE.

Lindsay Rand from Carleton College in Northfield, MN, is working on developing a composite Mg II record



REU student Lindsay Rand (left) with her LASP Mentor, Odele Coddington.

using a Bayesian approach to source separation under the guidance of Odele Coddington and Marty Snow. She is using wavelet analysis to compare SORCE measurements to the Bremen and NOAA composite Mg II measurements.

Hayley Roberts from Illinois Wesleyan University, Bloomington, IL, is improving the algorithms used to process solar images by using a Graphics Processing Unit (GPU) instead of the traditional CPU. If successful, her work will lead to a tenfold improvement in performance. Her three mentors, Jerry Harder, Stéphane Beland, and Mark Rast eagerly await her results.



Left to right: Mentor Stéphane Beland, SORCE summer student Jamie Mothersbaugh, mentor Jerry Harder, and REU student Haley Roberts.

JASTP Paper –

Jae Lee from NASA GSFC and the Joint Center for Earth Systems Technology at the University of Maryland-Baltimore County recently published a SORCE paper in the *Journal of Atmospheric and Solar-Terrestrial Physics*. The highlights of “The 27-day rotational variations in total solar irradiance observations: From SORCE/TIM, ACRIMSAT/ACRIM III, and SOHO/VIRGO” are 1) Satellite observations of TSI from SORCE/TIM, ACRIM III, and SOHO/VIRGO are analyzed; 2) During the last decade, observations of TSI provided unprecedented accuracy and stability; 3) The TSI measurements are analyzed by the EEMD to characterize the solar rotational variation; 4) During the declining phase of solar cycle, the amplitude of the variation is high as 0.8 W/m^2 ; and 5) The amplitude and phase of the variation is quite agreeable in three satellite TSI observations. Jae’s co-authors are Robert Cahalan and Dong Wu, both from NASA GSFC.

The paper reference is Lee, et al., JASTP, (2015), 132, 64-73, doi: 10.1016/j.jastp.2015.07.001, and online at <http://www.sciencedirect.com/science/article/pii/S1364682615300079>.

Abstract:

During the last decade, observations from *SORCE/TIM*, *ACRIMSAT/ACRIM III*, and *SOHO/VIRGO* provided Total Solar Irradiance (TSI) measurements with unprecedented accuracy and stability to determine the amount of solar irradiance reaching the top of the atmosphere and how solar irradiance varies on different time scales. These three independent measurements are analyzed using the EEMD (Ensemble Empirical Mode Decomposition) method to characterize the phase and amplitude of the 27-day solar rotational variation in TSI. The mode decomposition clearly identifies a 27-day solar rotational signature on TSI measurements. The rotational variations of TSI from the three independent observations are generally consistent with each other, despite different mean TSI values. During the declining phase of solar cycle 23, the amplitude of TSI 27-day variations is as high as 0.8 W/m^2 ($\sim 0.05\%$), while during the rising phase of solar cycle 24, the amplitude is up to 0.4 W/m^2 ($\sim 0.04\%$). During the minimum phase (2008–2009), the amplitude of the rotational mode is only $\sim 0.1 \text{ W/m}^2$. The correlation of this rotational mode between *TIM* and *ACRIM III* is ~ 0.92 and the slope of the local peak values is ~ 0.98 . The correlation between *TIM* and *VIRGO* is ~ 0.96 and the slope of the local peak values is ~ 0.98 , very similar to the slope with *ACRIM III*.

ISS-SOLAR Team Meeting –

By Marty Snow, LASP, Univ. of Colorado

Members of the SOLAR Facility Science Team (FST) met at ESTEC in Noordwijk, The Netherlands, on June 4–5. *SORCE* scientists Jerry Harder and Marty Snow participated along with scientists from both *SOLSPEC* and *SolACES* instrument teams. We discussed the current status of the instruments and data processing for both instruments. We also made plans for team-wide collaboration on improving the calibration of the *SOLSPEC* data.

The FST now includes a number of scientists from LASP, and we hope to be able to share some of our experience in analysis of solar spectral irradiance data. The

European Space Agency (ESA) will sponsor additional FST meetings in the near future. Alexander Shapiro (now at the Max Planck Institute for Solar Physics – MPS) volunteered to organize the FST meetings. We look forward to additional collaboration between *SORCE* and *ISS-SOLAR*.



ISS SOLAR Team Dinner was enjoyed by all. The sunset during that week occurred at 10 pm in The Netherlands.

Upcoming Meetings / Talks –

SORCE scientists will present papers or attend the following 2015-2016 meetings/workshops:

IAU XXIX General Assembly, Aug. 2-6, Honolulu, HI
NCAR / High Altitude Observatory's 75th Anniversary

Celebration, Sept. 1-3, Boulder, CO

Solar Metrology, Needs and Methods Symposium,
Sept. 21-23, Brussels, Belgium

**Sun-Climate Symposium (*SORCE/SCRC* Mtg),
Nov. 10-13, Savannah, GA**

AGU Fall Meeting, Dec. 14-18, San Francisco, CA

ISSI Team "Solar Heliospheric Lyman Alpha Profile
Effects (SHAPE)", January 2016, Bern, Switzerland

