



2018 Sun-Climate Symposium –

Please mark your calendar today to join us in March 2018! We encourage your participation and hope that you will share this announcement with colleagues.

***Lake Arrowhead, California
March 19-23, 2018***

<http://lasp.colorado.edu/home/sorce/news-events/meetings/2018-scs/>

We are pleased to announce the 2018 Sun-Climate Symposium, which is sponsored by the Sun-Climate Research Center – a joint venture between NASA GSFC and CU/LASP. Our focus topic for this 3.5-day meeting is ***“The State of the TSI and SSI Climate Records at the Junction of the SORCE and TSIS Missions.”***



The evening sunset on beautiful Lake Arrowhead.

Science Overview

Observations of the Sun and Earth from space have revolutionized our view and understanding of how solar variability and other natural and anthropogenic forcings impact Earth’s atmosphere and climate. Since 1978 – more than three solar cycles – the total and spectral solar irradiance (TSI and SSI) and global terrestrial atmosphere and surface have been observed continuously, providing unprecedented quality data for Sun-climate studies. The 2018 Symposium will convene experts from across the solar-terrestrial community and from various disciplines that include Sun-climate connections, atmospheric physics and chemistry, heliophysics, and metrology to

discuss solar and climate observations and models during this crucial period near the end of the Solar Radiation and Climate Experiment and the start of the Total and Spectral Solar Irradiance Sensor (TSIS) Mission. Sessions will be organized around the following six themes:

Sessions and Descriptions

Like our past meetings, the format will consist of invited and contributed oral and poster presentations in several themed sessions. The Call for Abstracts will be advertised in late summer – stay tuned.

1. Making accurate Climate Records

This session will discuss the requirements for making climate data records (CDRs), what qualifies as a CDR, the scientific understanding gained from the CDRs, and the challenges that exist for future climate measurement systems and models. The session is open to climate data records of all kinds and the broad range of science questions that is or can be addressed with CDRs.

2. The state of the TSI and SSI Climate Records near the end of the SORCE Mission

This session will address the total solar irradiance (TSI) and solar spectral irradiance (SSI) measurement records since the start of the space era. Emphasis is given to how measurements of the last decade have been reconciled with and contributed to composite records with associated time-dependent uncertainties.



Sunset over the San Bernardino Mountains in southern Cal.

3. What was learned about solar variability and impacts on the terrestrial environment during SC 24?

This session will address the following questions.

- With SC24 being one of the weakest solar cycles during the past 90 years, can we reliably discern the terrestrial signatures of the current solar inactivity—at the surface, in the stratosphere and in space weather?

Fall AGU – Abstracts Due Aug. 2nd

- It has been established that the upper atmosphere density has had a long-term decrease from cooling above 300 km by greenhouse gases and due to the reduced solar activity in SC24. Are there similar indications in the lower atmosphere for warming due to greenhouse gases and other changes due to reduced solar activity?
- What does understanding of the present (in the context of the past) infer for the future variability of Earth's environment?

4. *What are the expectations for the next solar minimum and SC 25?*

This session will address the following questions.

- Are spectral and total solar irradiance levels lower now than during past minima, and how much might they change during solar cycle 25?
- Are we entering a new prolonged period of anomalously low activity such as the Dalton Minimum in the early 1800s?
- Can we identify anomalous behavior in the solar dynamo and surface magnetic flux transport as we enter this next cycle minimum and can these behaviors forecast SC25 activity?

5. *Stellar variability and connections to the Sun*

This session will address the following questions.

- How typical is the cyclic activity of our Sun relative to Sun-like stars?
- What have we learned from the Kepler Mission and ground-based synoptic programs about the ranges of total and spectral irradiance variability?
- What progress have we made in understanding what controls the amplitude and length of cyclic activity in a Sun-like star?

6. *Next generation of solar and atmospheric observations*

This session will discuss new missions, sensors, and implementation strategies required for a next-generation observing system to meet the current and future challenges facing climate change studies.

Venue

The ***UCLA Lake Arrowhead Conference Center*** is a state-of-the-art full service retreat facility on the north shore of beautiful Lake Arrowhead in southern California.

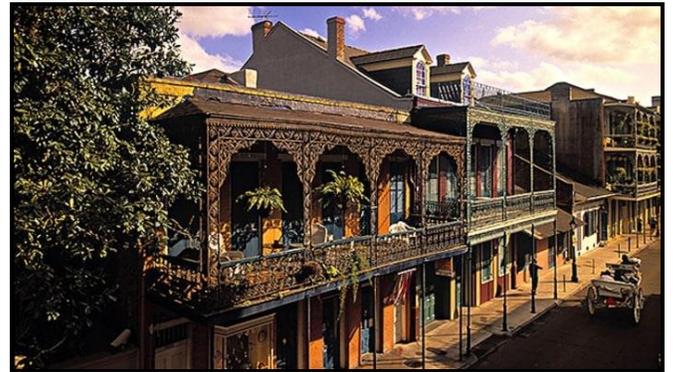


Meeting attendees will enjoy the fresh air and 42 acres of beautifully forested terrain tucked in the San Bernardino Mountain foothills (5000 ft.). For more information, visit their website at:

<http://lakearrowheadconferencecenter.ucla.edu/>.

Fall 2017 AGU Meeting, Dec. 11-15, New Orleans, LA

Abstract deadline: Wed., August 2nd



You are encouraged to submit abstracts to the SORCE-related irradiance session below. The abstract submission site is:

<http://fallmeeting.agu.org/2017/abstract-submissions/>.

SH011: Solar Radiative Variability: From Minutes to Millennia. The Sun's Influence on the Earth's Space Environment, Atmosphere, and Climate

Conveners: Martin Snow (primary), LASP, Univ. of Colorado; Odele Coddington, LASP, Univ. of Colorado; Natalie Krivova, Max Planck Inst. for Solar System Research, Germany; and William Ball, Physical Meteorological Observatory Davos (PMOD WRC), Switzerland

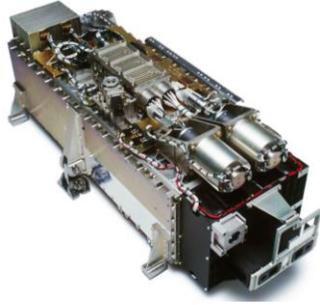
Web: <https://agu.confex.com/agu/fm17/preliminaryview.cgi/Session23451>

Session ID# 23451: Variability of the incoming solar irradiance and its effects on the terrestrial environment and climate have received wide attention in recent years. There is a continuous effort to reduce measurement uncertainties of the total and spectral solar irradiances. Physical and empirical modelling have also made considerable progress in reconstructing accurate and reliable records. At the same time, numerical models and observations have been extensively used to characterize the influence of solar irradiance variability on Earth's atmosphere and climate. This session invites abstracts on measurements and models of solar spectral and total irradiance on all time scales, as well as abstracts on the response of the surface, atmosphere and the heliosphere to solar radiative forcing. Abstracts focused on comparisons of surface and atmospheric effects to different solar irradiance datasets are particularly welcome.

~ Join us! ~

SIM Releases Version 23 –

SIM Version 23 (V23) was introduced on May 2, 2017. Below are the release notes for V23, Level 3 data product.



SORCE SIM V23 employs the same correction methodology as employed in V22 but now includes a revision in the exposure time record bringing the exposure record up-to-date rather than extrapolating the exposure and increases the exposure time in before day 180 to account for non-physical trends in the earlier part of the mission.

1. Processing code re-instates the daily calculation of SIM A and SIM B exposure time. This step required additional processing code changes because the SORCE planning page (employed prior to the DO-Op mode) does not necessarily reflect the actual executed experiments.

2. As in V22 data, offset corrections are performed at the boundaries where spacecraft safe-hold events introduce offsets in the measured irradiance. Offset corrections are made by selecting time periods before and after the safe-hold events where the passages of solar active regions do not disturb the locally flat time series. The difference in the median irradiance for these two time ranges is added to the time series after the safe-hold event. This problem is exacerbated in the SIM data during the DO-Op mode since there is an ambiguity in closing the 225-day data gap in the extension of this record.

Users of SIM V23 should consult the V22 and V21 release notes for more information about the data correction methodology:

<http://lasp.colorado.edu/home/sorce/instruments/sim/sorce-sim-data-products-release-notes/>.

The successful resumption in the production of daily SIM data is reflected by continued agreement between the SIM A and SIM B channels in a time period spanning the 225-day time period. Examples of this are shown on the website release notes page (link above).

SIM V24 is in development and it will emphasize:

1. Continued analysis of the effective solar exposure for the UV and the VIS photodiodes as the measurements proceed.

2. The ESR data remains significantly noisier after the start of the power cycling due to temperature instabilities. These are attributed to either changes in the electrical characteristics of the ESR or a potential lag in the measured and actual temperatures of the ESR. This same observation is appropriate for the visible photodiode in the 850-950 nm range where some of the structure seen in the data reflect uncorrectable temperature instabilities.

3. Additional analyses of the offset corrections.

SOLSTICE Data Processing Status –

SOLSTICE Version 15 (V15) was released in October 2015 and is still working well. The SOLSTICE team is continuing analysis of the early-mission calibration data to better understand degradation trends. We have also resumed taking occasional stellar measurements, so the next version will also incorporate those. We are aiming for a new data release this fall.



Routine processing of V15 SOLSTICE data is ongoing, and data products are available on the SORCE website (<http://lasp.colorado.edu/home/sorce/data/>) and through LISIRD at LASP (<http://lasp.colorado.edu/lisird/sorce/>).

ISS/SOLAR Facility Science Team Meeting at ESTEC –

Marty Snow represented the SORCE team at the ISS/SOLAR Science Team Meeting in Noordwijk, The Netherlands, in mid-March. The primary focus of the meeting was on recent improvements to processing SOLSPEC data on the International Space Station. Recalibration of the first light data was published last year, and we have been able to compare irradiances in the 170-300 nm range to SORCE SOLSTICE observations. The agreement is within the calibration uncertainties of the two instruments. Members of the SOLSPEC team will return to Boulder in August to work on comparing the time series from 2008 to 2017 in all of the wavelength bands that overlap SORCE SOLSTICE and SIM.



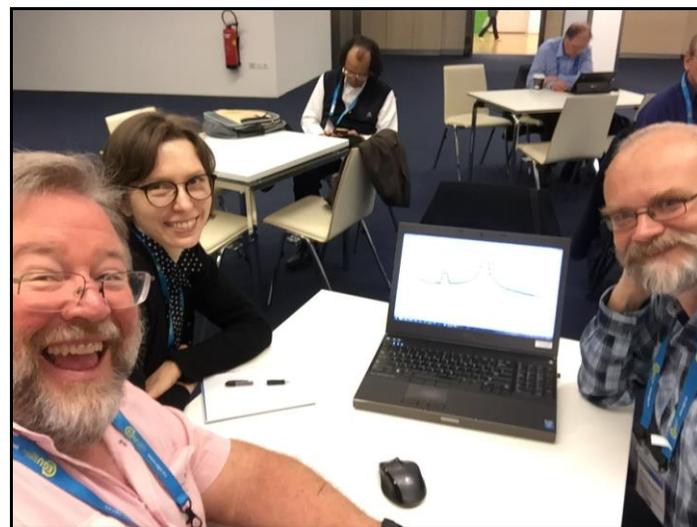
The group enjoys a quick lunch together between science discussions.

2017 EGU General Assembly –



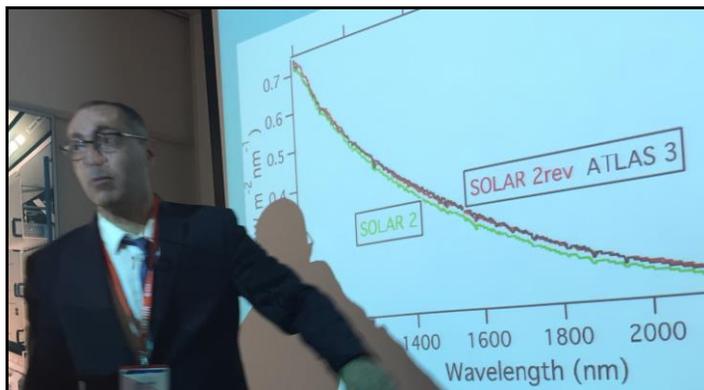
At this European Geosciences Union (EGU) General Assembly, held April 23-28 in Vienna, Austria, *SORCE* science data processing lead Stéphane Béland had the opportunity to meet with many scientists to discuss new instrument designs similar to *SORCE* instruments. He also discussed with them how their instrument degradation is monitored and corrected. New techniques are being used and it will be interesting to see how they perform after many years in orbit. Although many instrument teams are relying on proxies to track degradation, absolute measurements are essential to fully understand the spectral irradiance variations over multiple solar cycles.

Stéphane's EGU presentation focused on the *SORCE* SIM instrument, the limitations of the two-instrument model, and the expected benefits of the TSIS SIM three-instrument design and the proposed observing plan. He discussed lessons learned from *SORCE* SIM observations and how these can be applied to future instrument improvements. He was also able to attend many interesting talks covering various topics related to solar spectral irradiance (SSI) and the importance of these measurements for meteorological and climate models.



Marty Snow shares SOLSTICE Lyman alpha data during EGU with Justyna Sokol and Maciej Bzowski of the Polish Academy of Science.

Marty Snow also had poster in Session ST4.2: The Use of Observations and Models to Improve Space Weather Forecasting Capabilities. Titled "Magnesium II Index Measurements from *SORCE* SOLSTICE and GOES-16 EUVS" he specifically presented comparisons of the *SORCE* SOLSTICE and GOES-16 EUVS measurements during the overlap period. GOES-16 launched November 19, 2016 and instruments saw first light in January 2017.



Mustapha Meftah from France's LATMOS (Laboratoire Atmosphères, Milieux, Observations Spatiales) presented updated calibrations for SOLSPEC data in the infra-red.

Space Weather Workshop –

NOAA's Space Weather Prediction Center again hosted their annual meeting where the research, operations, and commercial space communities get together to share information about the state-of-the-art in space weather. They met on May 1-5 at the Omni Hotel in Broomfield, Colorado, for a full week of captivating presentations. *SORCE* PI, Tom Woods, gave a talk on LASP's cubesat program "Advanced Technology in Small Packages Enables Space Weather Nanosatellites." Marty Snow gave a poster on comparisons between the new GOES-16 MgII measurements and the *SORCE* SOLSTICE observations. Marty also participated in a student networking event organized by a former LASP REU intern, Mike Cook.

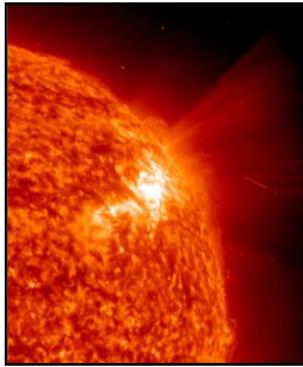


Scott McIntosh (HAO) and Michele Cash (NOAA) on the far right enjoyed a pre-workshop mixer with the students.

SORCE

SIST Meeting in May 2017 –

SORCE scientists and collaborators participated in a 2nd SIST Workshop for the NASA program called: Solar Irradiance Science Team (SIST). The primary purpose of the SIST research projects is to support the development of space-based data sets of total and spectral solar irradiance (TSI and SSI). The data sets will be used as input to global models to investigate solar variations and their impacts on the Earth climate and atmospheric composition.



Like the 1st Workshop in July 2016, the first day was taken up with presentations from each team giving a summary of the project goals, current status, and future plans. The second (half) day was discussion of how the various teams can work together for mutual benefit.



The SIST team discusses missions from the entire satellite era.

SIST plans to touch base again during the 2018 Sun-Climate Symposium in March at Lake Arrowhead Conference Center in California.

The SIST program is a 3-year award. In 2015 NASA awarded five of the seven SIST proposals to SORCE scientists.

- *Construction of a SORCE-based SSI record for input into chemistry climate studies of Solar Cycle 23-24* (PI: Jerry Harder, LASP)
- *SSI: Lyman Alpha, Magnesium II, and Sigma k proxiEs (SSIAMESE)* (PI: Marty Snow, LASP)
- *The analysis of improved laboratory measurements in the re-calibration and re-evaluation of the SORCE SIM data record* (PI: Erik Richard, LASP)
- *A TSI Community Consensus Composite Based on an Assessment of the Accuracies and Uncertainties of Space-borne TSI Measurements* (PI: Greg Kopp, LASP)
- *How does the Sun's Spectrum Vary?* (PI: Judith Lean, NRL)

The 2017 ROSES includes a call for the next round of SIST proposals. The AO # NNH17ZDA001N (A.19)

provides the following description: “The primary purpose of the Solar Irradiance Science Team (SIST) is to support the development of consistent multi-instrument/multi-platform space-based data sets of solar irradiance (both total and spectrally resolved).” The Notice of Intent/Step 1 is due August 4, and proposals are due October 6, 2017.

SORCE Selects Summer Undergrad Research Students –

Each summer, the SORCE mission funds student research projects in concert with the University of Colorado’s Research Experience for Undergraduates (REU) program. For ten weeks (up from the 8 weeks in past years), the students come to Boulder, Colorado to work with SORCE scientists on a research project involving measurements from SORCE. The program pays for the students’ travel costs and housing, plus a \$500/week stipend.

This year the program started the week of May 30th at LASP with a 1-week lecture series on Solar and Space Physics from experts in the field. The program will run through August 4th, ending with a student symposium where the students present their findings. Marty Snow is the REU Program Organizer for the entire program which includes 21 REU students working interesting solar and space physics projects in several Boulder locations.



A group selfie taken by their REU leader Marty Snow.

For 2017, three SORCE-related projects were selected for the REU program. The project title, mentors, and the REU student selected are:

- ***Got five minutes? Solar global oscillations in the MgII index***
REU Student: Erica Nathan, Colgate University, Hamilton, NY
Mentors: Andrew Jones (LASP), Janet Machol (NOAA), and Marty Snow (LASP)

- **Solar spectral irradiance: measurements vs models**
REU Student: Bailey Donaldson, University of Colorado, Boulder
Mentors: Stéphane Béland and Laura Sandoval (both from LASP)
- **Analysis of top-down solar influence using AIRS and SABER data**
REU Student: Santiago Mejia, Miami Dade College, Miami, FL
Mentor: Jerry Harder (LASP)

Total Solar Eclipse: August 21



Although *SORCE* won't be involved with the August 21st solar eclipse, you probably don't want to miss this special event! Without a coronagraph for solar eclipse observations, *SORCE* solar measurements do not include images, just radiometric and spectral irradiance values of the Sun. For the best eclipse viewing options and additional event details, visit:

<https://www.greatamericaneclipse.com/>.

SORCE Extended Mission –

In early March, the *SORCE* team submitted a Sr. Review Proposal for another extended mission (2018-2020). *SORCE* successfully completed its 5-year core mission (Jan. 2003-Jan. 2008) and is currently in its tenth year of its extended mission. It has achieved its primary mission goal of measuring total solar irradiance (TSI) and solar spectral irradiance (SSI) with unprecedented accuracy and precision. The main objectives of the *SORCE* extended mission are very much aligned with the original *SORCE* mission objectives, but have new focus with the current state of NASA missions and solar activity in Solar Cycle 24.



With proper management of spacecraft resources, we are confident that making good quality solar irradiance measurements will continue throughout the extended mission timeframe. Obtaining overlapping irradiance measurements with upcoming missions (such as *TSIS*) is critical, so *SORCE*'s extension is essential.

As a follow-up to the written proposal, a few of the *SORCE* scientists met with the NASA Sr. Review Panel in early May to respond to questions and items needing further clarification. The review panel is expected to make a decision on the next *SORCE* Extended Mission any day now.

Upcoming Meetings / Talks –

SORCE scientists will present papers or attend the following 2017-2018 meetings/workshops:

2017

ISSI Working Group: “Towards a Unified Solar forcing Input to Climate Studies”, Oct. 2-6, Bern, Switzerland
 AGU Fall Meeting, Dec. 11-15, New Orleans, LA

<https://fallmeeting.agu.org/2017/>

2018

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<http://lasp.colorado.edu/home/sorce/news-events/meetings/2018-scs/>

