



XPS Benefits from Rocket Data –

By Tom Woods, LASP, University of Colorado

LASP successfully launch its fifth calibration rocket (NASA 36.240) for the Solar Extreme ultraviolet Experiment (SEE) aboard the TIMED satellite on April 14, from the White Sands Missile Range in New Mexico. TIMED was launched in December 2001, and its SEE instrument requires an underflight calibration about once a year to accurately determine the long-term variations of the solar ultraviolet irradiance. The calibration payload includes solar instruments flown for about 20 minutes in space at a peak altitude of 280 km to obtain the necessary calibration measurement. The payload re-enters and lands via parachute and is recovered for use on future suborbital flights. The rocket instruments include the prototype XPS and prototype SDO EUV Variability Experiment (EVE) instruments.



Terrier - Black Brant IX rocket (2 stages) launched on April 14.

These measurements are particularly exciting because it is the first solar cycle minimum measurement of the solar EUV irradiance (despite several solar EUV measurements scattered over the past 60 years). These rocket measurements also provide calibration for SORCE XPS and additional validation for the H I Lyman- α

(121.6 nm) irradiance that is measured by SORCE SOLSTICE. Since January 2007, there has been a slow drift down of the SORCE XPS 0.1-7 nm irradiance (from XP#1 photometer) relative to the TIMED SEE XPS result. The rocket

measurement yields a XUV irradiance that is more consistent with SORCE XPS. The post-flight calibration of the rocket XPS and additional analysis of the SORCE XPS and TIMED SEE trends should better clarify the XUV calibration, but for now, the SORCE XPS appears to be more stable than the TIMED SEE XPS instrument.

SORCE Team Delighted by TSIS Reinstatement –

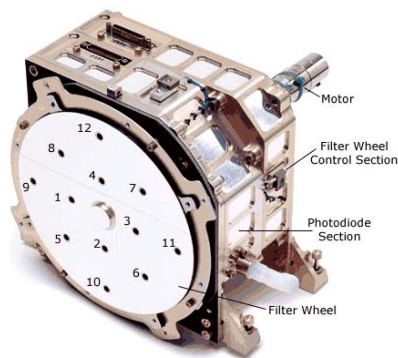
By Peter Pilewski, LASP, University of Colorado

Recently the National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Executive Committee, agreed to restore the Total Solar Irradiance Sensor (TSIS) to the program. TSIS was demanifested from the NPOESS payload during a restructuring in 2006 in an effort to save money.

TSIS, which will be built by LASP with PI Peter Pilewski leading, is comprised of two instruments: the Total Irradiance Monitor, or TIM, which measures the total solar irradiance (TSI) that is incident at the boundaries of the atmosphere, and the Spectral Irradiance Monitor, or SIM, which measures the wavelength dependence of the Sun's energy output, solar spectral irradiance (SSI). The TSIS TIM and SIM are follow-on instruments to those currently flying on SORCE.

A TIM will also fly on the NASA Glory Mission, scheduled to launch in 2009, to insure the continuity of the three-decade climate record for TSI by bridging the gap between SORCE and NPOESS TSIS. As a joint venture between NOAA, NASA, and the Air Force, NPOESS's first C-1 satellite is scheduled to launch in 2013, with additional program launches slated for 2015 and 2020.

The TSI data set, with its long and continuous high-precision record, constrains the total energy available to drive the climate system. The newer SSI data record, which began with SORCE in 2003, provides the wavelength dependent details necessary to resolve the underlying mechanisms and terrestrial interactions responsible for driving climate processes. Both are invaluable components for understanding the natural influences on climate and ultimately differentiating them from human-induced climate forcing. For these reason both instruments, TIM and SIM, were selected as part



of TSIS to fulfill the requirements for the NPOESS Solar Irradiance Environmental Data Record.

NOAA's news release can be found at:

http://www.noaanews.noaa.gov/stories2008/20080502_npoess.html.

NASA Solar Variability Story Highlights *SORCE* –

On May 8, NASA published a story called “Solar Variability: Striking a Balance with Climate Change” on their home page. The article discusses the general nature of solar variability. For the full article, visit:

http://www.nasa.gov/topics/solarsystem/features/solar_variability.html or it is also posted on the *SORCE* website – <http://lasp.colorado.edu/sorce/index.htm>.

SORCE Scientists Active in LASP Seminar Series –

Most Thursdays during the school year, LASP offers an overview talk on one of their many programs. Lately the *SORCE* scientists have been featured during this seminar series open to the general public.

Solar Spectral Variability as Measured by the *SORCE* SIM Instrument

By Jerry Harder, SIM Scientist, April 10

Abstract: The accumulated data from the SIM instrument represents the first time series that has sufficient precision and stability to discern solar cycle length trends in spectral variability in the visible and infrared portions of the spectrum. The detection of these trends relies on very sensitive degradation correction methods that are incorporated in the instrument design. The presence and evolution of active regions on the solar surface impart spectral signatures that are consistent with observations of total solar irradiance (TSI) and with SRPM modeling of these solar features. However, the long-term trends in solar network features present a difficult challenge for image analysis and consequently for the modeling as well. Because of this, the SIM spectral observations provide a valuable set of constraints for improving the models.

On longer time scales, the SIM data shows that at some visible and IR wavelengths the trends are out of phase with those observed in TSI. These trends depend on which depth in the solar atmosphere the radiation is emitted from; the out of phase trends predominantly originate from deep photospheric contributions, whereas the wavelengths that are in phase with TSI originate from the top of the photosphere and the chromosphere. Thus the TSI represents a very delicate balance of offsetting

spectral trends. Efforts are now underway to show how these differential trends in solar spectral variability might affect heating rates in the Earth's atmosphere and some simple modeling examples on this topic will be presented.

The *SOLSTICE* Science Sampler

By Marty Snow, SOLSTICE Scientist, May 8

Abstract: The SOLAR-STellar Irradiance Comparison Experiment (*SOLSTICE*) on the Solar Radiation and Climate Experiment (*SORCE*) is an extremely versatile instrument. The primary mission of *SOLSTICE*



is to observe the solar spectral irradiance. With its unique ability to also observe faint targets, we can measure the irradiance from bright stars, comets, and the Moon. We can also observe the Earth's atmosphere through airglow and stellar occultations. This talk will highlight the lunar irradiance

measurements. *SOLSTICE* has the unique ability to measure the ratio of solar to lunar irradiance with the same instrument, thus removing calibration uncertainties from the determination of the lunar ultraviolet albedo. *SOLSTICE* is continuing to make repeat observations of the Moon at all phase angles and wavelengths in its spectral band, yielding a dataset of very good signal-to-noise that can be used by other missions for calibration as well as providing basic information about the lunar surface properties.

TIM Data Processing on Version 8 –

*By Greg Kopp, LASP,
University of Colorado*



In early May the TIM instrument data processing migrated to Version 8 in producing the daily updated TSI values. Some of the Version 8 improvements are:

- Updated inter-comparisons show continuation of predicted degradation
 - Primary cavity currently has 150 ppm of degradation through early March 2008
- Using new on-orbit calibrations of non-equivalence
 - Calibrations raise TSI values by 220 ppm

- Using new servo gain corrections for temperature from on-orbit measurements
 - Change will have only a very small effect on TSI values
- Using updated gains through Feb. 2008
 - All instrument gains remain stable, so this won't noticeably affect TSI values

SORCE Participating in Summer 2008 REU Program –

After a successful 2007 summer with the REU program, SORCE scientists are anticipating the arrival of 3 new students for 2008. The University of Colorado offers the Research Experience for Undergraduates (REU) Program to highly motivated students interested in solar and space physics. Beginning June 8 for eight weeks, the students will work with the scientists on special projects from instrument hardware development to data analysis and modeling.

SOLSTICE scientist, Marty Snow will be working with two students on two projects. James McGrail (Univ. of Michigan) will focus on *Magnesium II Index Comparisons and Correlations*. This project will involve detailed comparisons between the NOAA SBUV/2 and SORCE SOLSTICE measurements to explore slight differences in long-term trends. The goal is to analyze the time series of MgII indices from all instruments relative to other wavelengths. James will become familiar with the instruments, the solar spectrum, and the IDL programming language required for data analysis.

Julie Feldt (Univ. of Kansas) will be working on the *Lunar Reflectance in the Ultraviolet*. SOLSTICE can measure the solar spectrum directly, as well as the sunlight reflected off the moon. The ratio of these two measurements can tell us about the properties of the lunar surface. Planning these observations requires detailed knowledge of the position and motion of both the moon and the spacecraft. Julie can focus on streamlining the planning on lunar observations by working on the ephemeris software, or he can help to reduce the reflectance observations.

Brian Kirby (Univ. of Michigan) will be co-mentored by SIM scientists, Erik Richard and Jerry Harder, on a hardware-based project to measure the temperature coefficient of radiant sensitivity of a silicon photodiode. This project will introduce Brian to precision radiometry, vacuum technology, and data acquisition. His work will be useful for corrections to SORCE data and to future LASP missions where photodiodes will be used as detectors.

518,195
Hits to the SORCE Website !
(Since 4/21/03, As of 5/9/08)

Upcoming Meetings / Talks – SORCE scientists plan to present papers or attend the following 2008 meetings:

Space Weather Workshop, April 29-May 2, Boulder, CO

Moon Mineralogy Mapper (M3) Meeting, April 30-May 1, GSFC, Greenbelt, MD

AGU Spring Meeting, May 27-30, Ft. Lauderdale, FL

CAUSES (SCOSTEP), June 1-6, Bozeman, MT

37th COSPAR Scientific Assembly, July 13-20, Montreal, Canada

International Radiation Symposium (IRS2008), Aug. 3-8, Iguacu Falls, Brazil

WHI (Whole Heliosphere Interval) Data and Modeling Assessment Workshop, Aug. 25-29, Boulder, CO

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