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Solar Radiation and Climate Experiment Monthly Newsletter

July 2005

2005 SORCE Science Meeting

September 14-16

Durango, Colorado

Abstract Deadline – August 1

Registration / Lodging Deadline – August 12

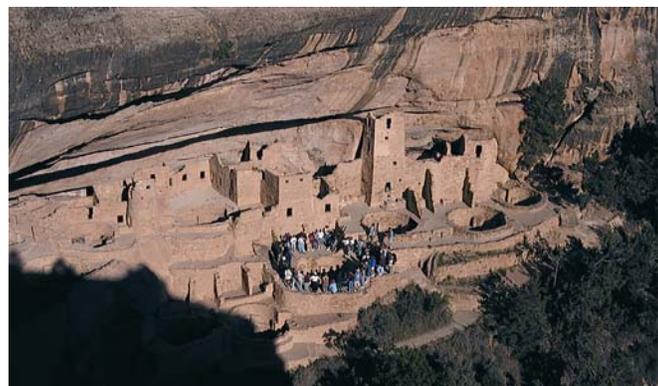
SORCE Science Dinner

Thursday, Sept. 15, Strater Hotel

The guest speaker for the SORCE Science Dinner on Thursday evening, September 15, is Dr. Mark Varien, Director of Research at the Crow Canyon Archeological Center in Cortez, Colorado. The nationally recognized Crow Canyon facility is dedicated to understanding, teaching, and preserving the rich history of the ancient Pueblo Indians who inhabited the canyons and mesas of the American Southwest. Since 1983, Crow Canyon researchers have studied in detail the archaeology of the Mesa Verde region.



Dr. Varien's talk will be "*Modeling of Historical Ecology – Seven Centuries of Pueblo Indian Settlement in the Mesa Verde Region*". By surveying ancient villages in Western Colorado, he has made important discoveries about the early inhabitants, their culture, and their physical environment. One special area he is



The archeological sites found in Mesa Verde National Park (outside of Durango) are some of the most notable and best preserved in the United States. Meeting attendees will have the opportunity of a guided tour of the Park on Friday afternoon, Sept. 16.

researching is the severe drought that occurred between A.D. 1140 and 1180. They hope to understand how ancient communities interacted with their environment and in particular how they handled and coped with this 40-year drought. Studying the timbers (tree rings) is one tool researchers use to analyze drought patterns, which might lead them to discover how the inhabitants were able to survive.

Besides climate issues, Dr. Varien studies sites to understand how their buildings were used (homes or community structures), pottery and tools – where they were originally made and where they are later found, and the political and social structure of these communities. The area in southwest Colorado has been under investigation for over 100 years and they hope to reveal much more information, while at the same time minimizing stress to these excavation sites. With new and more advanced research techniques, typically 1% of any site is disturbed during excavation.

We hope you can join us for this very special evening with Dr. Varien at the SORCE Science Dinner. Please register and pay for this event on the Meeting Registration Form. Everyone is invited to attend the SORCE Science Meeting – *Paleo Connections Between the Sun, Climate, and Culture* – in Durango, Colorado, a town rich in history, beauty, and southwest culture. Complete meeting information is available at – <http://lasp.colorado.edu/sorce/2005ScienceMeeting/>, where you will find a detailed science program description, tentative agenda (final to be available in mid August), confirmed speakers, online abstract and registration forms, as well as lodging and other logistical information.

Deep Impact Follow-up –

SOLSTICE planned and executed a series of observations of comet Tempel 1 on July 3. Unfortunately the impact was not bright enough to be detected by SOLSTICE. The impact crater on the comet was estimated to be the size of a house, and the cloud of ejecta was fairly modest. Some predictions had indicated that the crater would be the size of a football field, which might have produced a much larger ejecta cloud. As it turned out, the comet briefly brightened by about a factor of five, which is still well below the SOLSTICE detection threshold.



SORCE Presentations at Solar Variability and Earth Climate Symposium in Italy –

By Jerry Harder, SIM Instrument Scientist

This symposium organized by the Rome Observatory was attended by international scientists that work on solar irradiance variations and Earth climate issues. The scientific organizers of the meeting, Ilaria Ermolli (Rome Observatory), Peter Fox (HAO) and Judit Pap (GSFC) are to be complimented for putting together this very interesting meeting in an exquisitely beautiful setting. The conference was held June 27 through July 1 at a villa just outside of Rome currently owned by the University of Rome Tor Vergata. The villa has a very rich and fascinating history as well as architectural style; it was constructed starting in 1571, but was built upon the still existent ruins of the Villa Tusculanum erected by the Quintili, Roman consuls of the year 151 A.D. The room where the conference was held was the same room in which the Gregorian Calendar was signed into law in 1582.

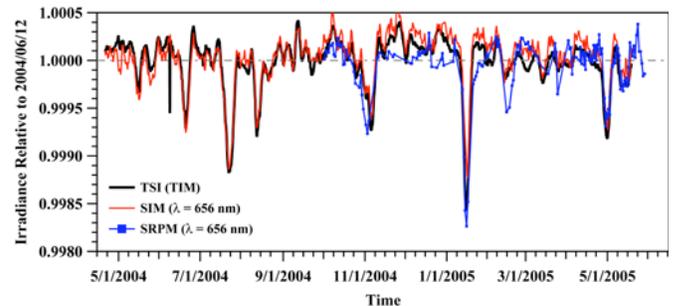
Jerry Harder and Juan Fontenla were invited to talk on SORCE related research. Jerry spoke on “*Solar Spectral Irradiance Variability Comparisons of the SORCE SIM Instrument with Monitors of Solar Activity and Spectral Synthesis*” and Juan gave a talk on “*Physical Models for Understanding the Solar Irradiance Variations*”.

Juan presentation concentrated on the development of the SRPM model (Solar Radiation Physical Modeling). The SRPM method uses 7 semi-empirical model atmospheres for sunspot umbra and penumbra, plage, network, and quiet Sun in the computation of the spectrum emitted from each of these seven surface features at any position of the solar disk. For computing irradiance, these spectra are weighted according to the surface structures seen on the Sun at a given time and combined in the spectral irradiance estimate.

In Jerry Harder’s talk, he used results of the SRPM model and the SORCE SIM and TIM instruments to



analyze the time series of solar spectral irradiance variations over the span of about one year. The presentation discussed the fact that one cannot expect a “typical” active Sun irradiance change because activity takes various forms such as sunspots, faculae, plage, and active network and all contribute uniquely throughout the solar spectrum. Since each type of surface feature evolves differently, combination of their effects in integrated radiation from the entire solar disk produces the complicated variations seen in the irradiance time series. A combination of the TIM and SIM measurements, and the SRPM analysis provide a very effective method to study solar irradiance variations that are important for climate studies.



The figure compares the relative irradiances time series measured by SIM and calculated by the SRPM model at 656 nm to TIM TSI measurement. At 656 nm, the relative variations of the spectral measurements most resemble the TSI. The time series was ratioed to the irradiance on reference day (6 June 2004) to show only these relative changes. The agreement between these three traces is remarkable, but the subtle differences between them give insight into the nature of the mechanisms causing irradiance variability.

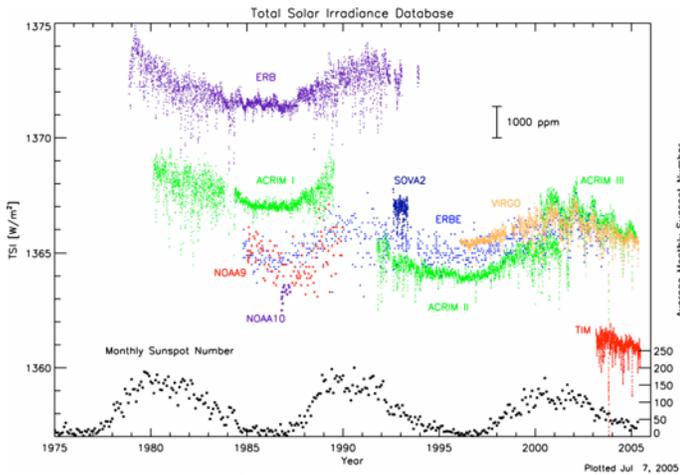
Total Solar Irradiance Accuracy Workshop –

By Greg Kopp, TIM Scientist

NIST and NASA recently sponsored a workshop to discuss the accuracy of the total solar irradiance (TSI) database, a record that now includes 26 years of space-based measurements (see next figure). The workshop was held at NIST in Gaithersburg, MD from 18-20 July, and included participation by teams representing each of the space-borne TSI instruments except for the original NIMBUS7/ERB. The aim of the workshop was to discuss:

1. the uncertainties in each instrument’s calibration accuracy,
2. the ability of each instrument to track degradation throughout its life, and
3. future improvements to calibrations of TSI instruments.

During the first day of the workshop, attendees reviewed the design and the calibration uncertainties of each instrument. Each instrument team described the



The space-borne TSI record now spans 26 years and samples portions of three solar cycles. Main focuses of the TSI Accuracy Workshop were to quantify the absolute accuracy of each instrument to understand the offsets between them and to study the long-term ability to monitor solar variability despite instrument degradation.

uncertainties in the parameters of their instrument's measurement equation. They discussed methods used in determining critical calibrations, such as aperture area and cavity sensitivity. Many of these instruments include multiple cavities, so variations in TSI measurements between the cavities can be used as lower bounds on the true instrument accuracy. In many cases, these intra-instrument variations exceed the stated uncertainty of the instrument, implying some stated uncertainties are underestimated. This meeting was the first time such detailed data were presented on the inner workings of each instrument.

The next day focused on degradation tracking within each instrument. Tracking instrument sensitivity with time (i.e. as exposure to unfiltered sunlight changes cavity absorption or particle radiation affects electronic sensitivity) is critical to monitoring secular trends in the solar irradiance. The ACRIM, VIRGO, and TIM can each track changes with solar exposure, and these teams presented their results and uncertainties in this long-term correction.

On the final day of the meeting, attendees discussed some possible causes of differences between each instrument and showed concepts on what technologies or facilities would provide future calibration improvements. NIST, responsible for the TIM aperture measurements, presented the results of their aperture measurement comparison with the VIRGO/DIARAD, VIRGO/PMO, and ERBE teams; this comparison still needs representative ACRIM apertures to be complete. NIST also presented diffraction calculations that indicate some instruments in the TSI database are currently reporting TSI values that could be up to 0.12% too high. NIST and L1 Standards and Technology, Inc. showed concepts for end-to-end irradiance calibrations

of future TSI instruments. Plans were made for a NIST power inter-comparison between each of the TSI instruments to begin later this year.

The workshop had the knowledgeable representation of each instrument team to answer detailed questions and was small enough to encourage informal interactions between members of the TSI instruments teams, NIST, and NASA. The workshop was very open and effective at getting everyone critically thinking about their instrument accuracy. A smiling Dick Willson summarized it well by saying, "We haven't had a meeting like this in 20 years!"

126,849

Hits to the *SORCE* Website

(Since 4/21/03, As of 7/22/05)

*Upcoming Meetings / Talks –
SORCE scientists plan to present papers or attend
the following 2005 meetings:*

- SPIE, July 31-August 3, San Diego, California
- IAMAS 9th Scientific Assembly, August 2-11,
Beijing, China
- Characterization and Radiometric Calibration for
Remote Sensing, August 23-25, Logan, Utah
- SORCE Science Meeting, September 14-16,
Durango, Colorado
- NASA Solar and Space Physics and the Vision for
Space Exploration Conference, October 16-20,
Wintergreen, Virginia
- NEWRAD 2005: 9th International Conference on New
Developments and Applications in Optical Radi-
ometry, October 17-19, Davos, Switzerland



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