SNS – SORCE News Source

Solar Radiation and Climate Experiment Monthly Newsletter **Sept. – Oct. 2011**

SORCE Science Meeting Summary –
"Decadal Cycles in the Sun, Sun-like Stars, and Earth's Climate System

Approximately 75 scientists gathered for the 2011 Solar Radiation and Climate Experiment (SORCE) Science Team Meeting, ***Decadal Cycles in the Sun, Sun-like Stars, and Earth's Climate System*,** Sept. 13-16, in Sedona, Arizona. The discussions covered a wide range of current solar and earth science research. A summary of the meeting, including .pdf versions of the many excellent presentations and a complete photo gallery, is available at: http://lasp.colorado.edu/sorce/news/2011ScienceMeeting/index.html. ("Meetings" are under "News and Events" on the SORCE main web page.)

Introduction and Meeting Overview

The 2011 NASA SORCE Science Team Meeting was jointly sponsored for the first time ever with the newly established NASA GSFC / CU LASP Sun Climate Research Center (SCRC). Since its launch in 2003, SORCE has been measuring total solar irradiance (TSI) and solar spectral irradiance (SSI), which are part of NASA Earth Observing System's 24 key observables. Using these measurements, SORCE and SCRC scientists share a common goal in their desire to understand solar variability and the Sun's influence on climate and global change.

The specific objective of this meeting was to gain a deeper understanding of solar cycle variations, Sun-like star variability, solar influences on climate change, and decadal climate variations. The meeting was especially timely as the science community anticipates an upcoming solar cycle that will likely differ significantly from the past three cycles.

The SORCE Meeting was held at the beautiful *Sedona Hilton Resort & Spa* – surrounded by stunning views of the majestic red rock formations in the area.

Within miles of the SORCE Meeting facilities, Bell Rock is one of the local attractions, providing excellent hiking and running trails.

Key questions addressing the current state of and future expectations for the integrated Sun-Earth system are:

- What can we learn about decadal climate response and climate sensitivity using the solar cycle as a well-specified external radiative forcing?
- What is the current understanding of the amplitude of solar spectral variability and the response of the Earth's atmosphere and climate system?
- How does total solar irradiance vary over the solar cycle and what are the implications for climate modeling to recent refinements in its magnitude?
- How do comparisons with Sun-like stars improve our understanding of solar variability?
- How can solar and climate models be advanced to better reproduce decadal variability and improve forecast capabilities?

The SORCE Science Meeting got underway with a Welcoming Reception on Monday evening, Sept. 12. On Tuesday morning Tom Woods, SORCE Principal Investigator, kicked-off the 3.5 days of sessions with a welcome and meeting introduction. **Session 1. *Solar Irradiance Cycles,*** consisted of 15 speakers including Keynote Speaker Yvonne Unruh, Matt DeLand, Jerry Harder, Dick Willson, Greg Kopp, Erik Richard, Werner Schmutz, Steven Dewitte, Claus Frohlich, Judith Lean, Thierry Dudok de Wit, Dora Preminger, Matthieu Kretzschmar, Jeff Morrill, and Gary Rottman.

^ ^ Tom Woods (LASP, SORCE PI) opened and closed the 2011 SORCE Meeting.

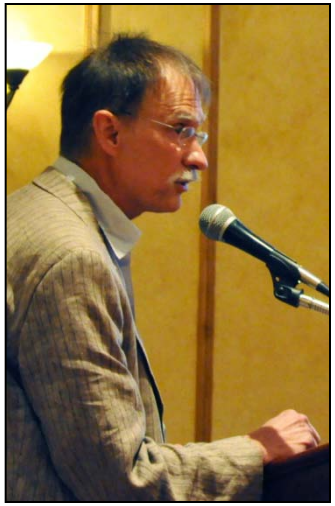
< < Session 1 Keynote Speaker Yvonne Unruh's (Imperial College) opening talk was *Modeling SSI*.

^ ^ The 2011 SORCE Meeting was co-sponsored by the NASA GSFC / CU LASP Sun Climate Research Center (SCRC). Bob Cahalan gave an introductory talk on SCRC.

^ ^ Judith Lean (NRL) spoke on *Solar Irradiance Decadal Trends.*

^ ^ Thierry Dudok de Wit (CNRS and Univ. of Orleans, France) gave a very passionate invited talk.

^ ^ Dora Preminger from the San Fernando Obs. at California State Univ. – Northridge.



< < Werner Schmutz (PMOD/WRC, Davos, Switzerland) presented *PREMOS TSI Results.*

> > Gary Rottman (LASP, original SORCE PI) closed Session 1 with a talk on the 30-year anniversary of the SME (Solar Mesosphere Explorer) mission .

The highlight of **Session 2. *Climate System Decadal Variability*** was Keynote Speaker Karin Labitzke (Freie Univ. Berlin, Germany). Other speakers were Vikram Mehta, Alexander Ruzmaiken, John McCormack, Mark Serreze, Stergios Misios, Hua Lu, Pat Hamill, Lon Hood, Jae Lee, Hiroko Miyahara, and King-Fai Li.

< < Keynote Speaker Karin Labitzke presenting *On the QBO-Solar Relationship throughout the Year.*

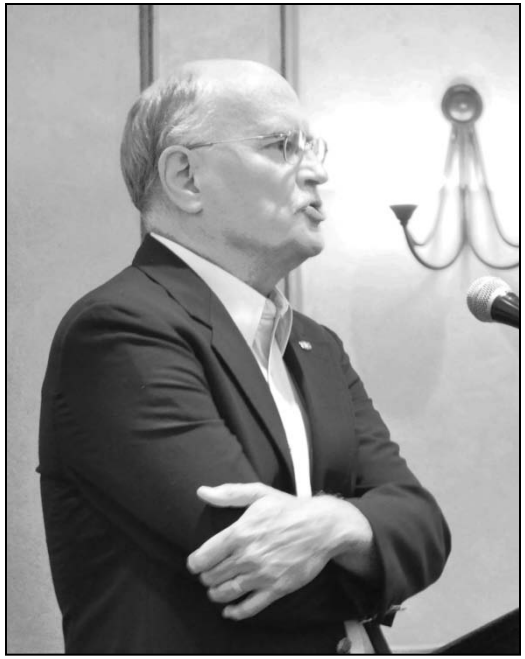
> > Hua Lu (British Antarctic Survey, Cambridge) discussed her research on non-linear and non-stationary influences on geomagnetic activity on the winter North Atlantic oscillation.

> > Stergios Misios (Max Planck Inst., Germany) discussed the solar cycle signal in the tropical Pacific Ocean.

< < Jae Lee (left, NASA JPL) and Hiroko Miyahara (right, Univ. of Tokyo) both gave contributed talks in Session 2, (and later enjoyed a visit to the Lowell Observatory).

Alexander Ruzmaikin (NASA JPL) gave an interesting talk on one aspect of decadal variability. v v

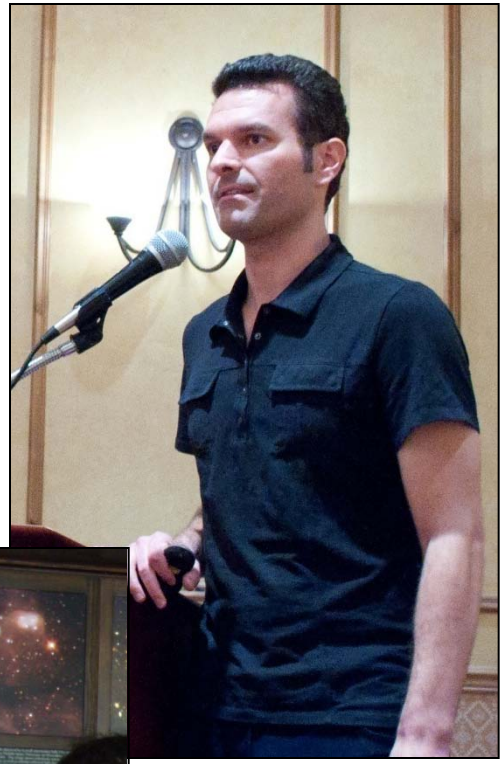
> > There was plenty of interesting audience discussion during the SORCE Meeting.



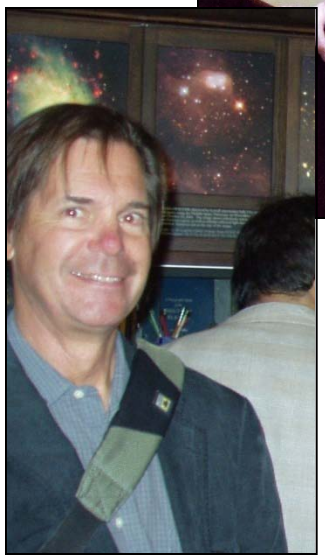
Session 3. ***Comparative Sun-Star Cycles,*** chaired by Marty Snow (LASP) began with a Keynote talk by Richard Radick from the AF Research Lab, Natl. Solar Observatory, in Sunspot, New Mexico. The session continued with 4 speakers, including Wes Lockwood, Ben Brown, Travis Metcalfe, and Tom Ayres.

< < Richard Radick spoke on *Cyclic Variations of Sun-like Stars.*

Ben Brown (Univ. of Wisconsin-Madison) gave a captivating talk on *Modeling Sun-like Stars.* v v



^ ^ Travis Metcalfe (HAO/NCAR) talked about the *HAO-NOSO-SMARTS Southern HK Project.*



< < Tom Ayres (CASA, CU) gave a very colorful talk about *Other Suns.*

Wes Lockwood (Lowell Observatory) covered the topic of *Solar Variability after Dark.*

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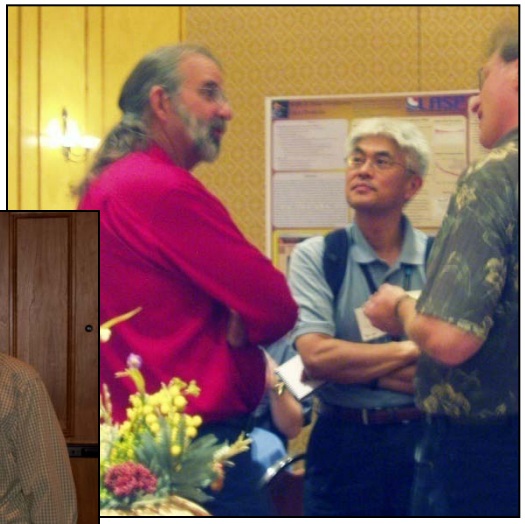
To conclude Wednesday, day 2, a special **Poster Session** was held to highlight the many excellent posters presentations. Attendees enjoyed refreshments while they wandered through the poster area and discussed their content with the authors.



^ ^ Left to right: Mark Serreze (CU/NSIDC), Seiji Kato (NASA Langley), and Rodney Viereck (SWPC/NOAA).

^ ^ Phil Judge and Hanli Liu (left to right), both from HAO/NCAR.

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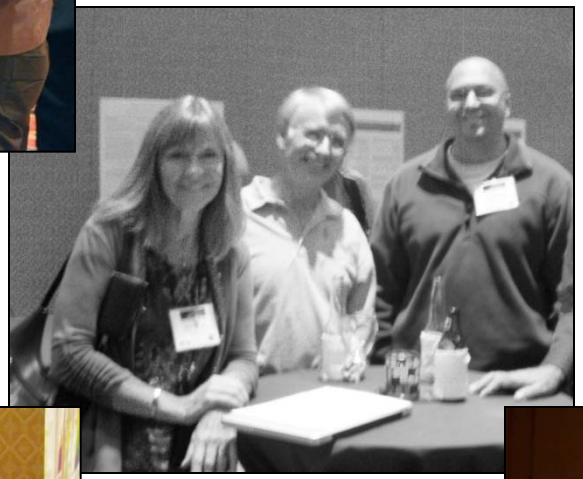
Left to right: Debra Vane (JPL), Kevin Trenberth (NCAR), and Andrew Dessler (Texas A & M).



< < Hari Om Vats (Physical Research Laboratory, India) discussing his poster, *Asymmetric Distribution of Solar X-ray Flares*, with Yvonne Unruh (Imperial College).

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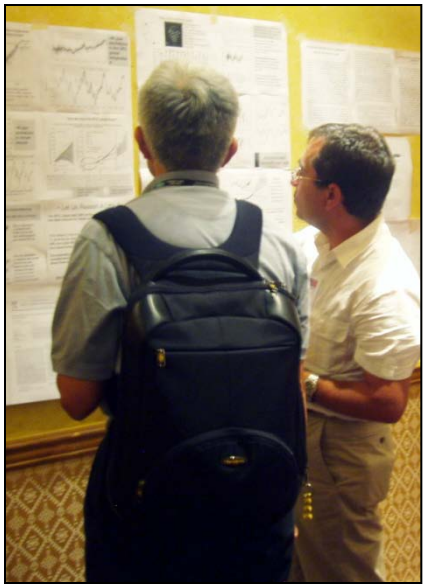
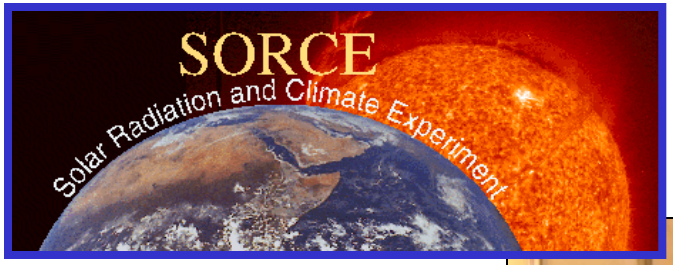
George Lawrence (left, LASP/CU) and Ben Brown (Univ. of Wisc.-Madison).



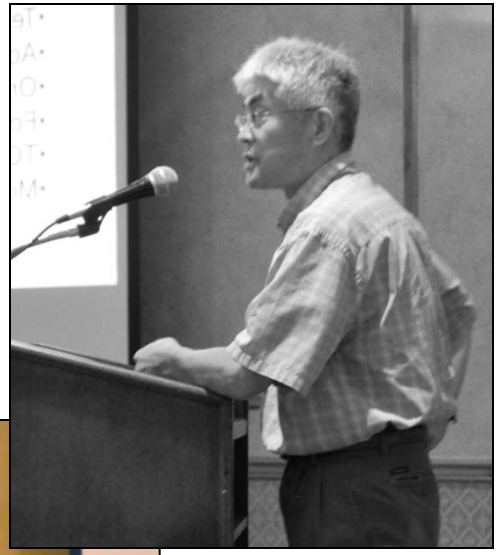
^ ^ Seiji Kato (NASA Langley) listens to Nicola Scarfetta (Duke Univ.) explain his poster on solar cycles and planetary oscillations.

Session 4. ***Climate Sensitivity and Global Energy Imbalance*** began on Thursday morning with Keynote Speaker Gerald North presenting *Climate Sensitivity.* Brian Soden and Andrew Dessler followed before the break. The session continued with another Keynote talk given by Kevin Trenberth, who spoke on *Tracking Earth Energy.* Seiji Kato and Peter Pilewskie completed the session.

< < Gerald North (Texas A&M University).



> > Andrew Dessler (Texas A&M University) spoke on *Observational Constraints on the Water Vapor and Climate Feedbacks*.



^ ^ Seiji Kato (NASA Langley Research Center).

Brian Soden (Rosenstiel School for Marine and Atmospheric Science, Miami, Florida). v v

< < Kevin Trenberth (National Center for Atmospheric Research).
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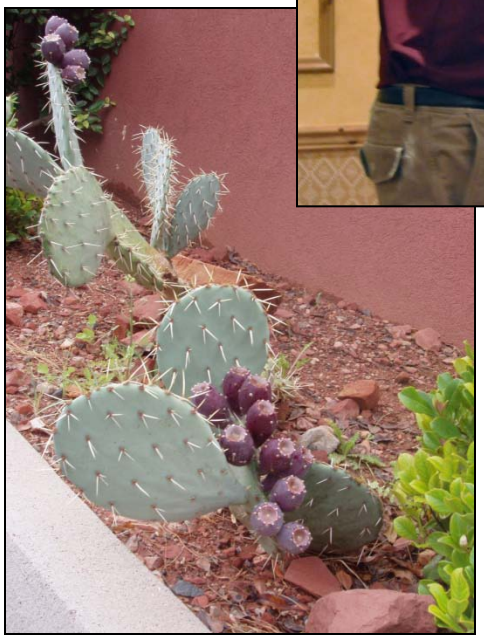
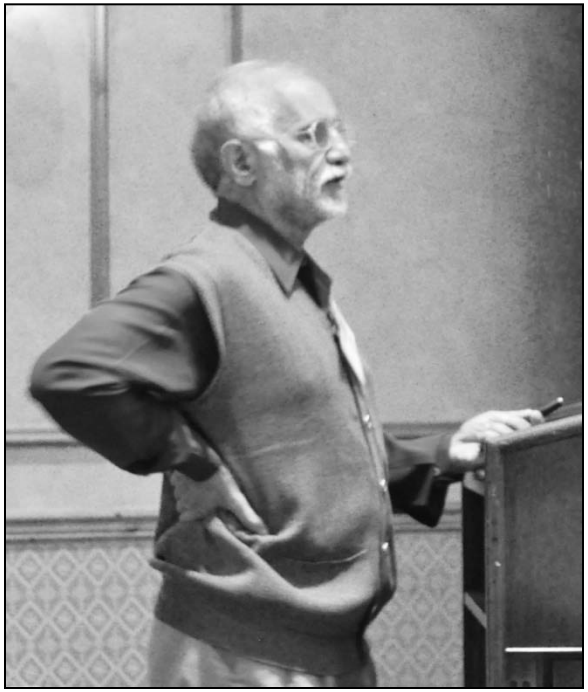


Tom Woods chaired **Session 5. *Solar Rotational Variability,*** which had 4 speakers – Marty Snow, Matthieu Kretzschmar, Bill Peterson, and Hari Om Vats.



< < Hari Om Vats (Physical Res. Lab., India) explained *Rotational Modulation on TSI.*
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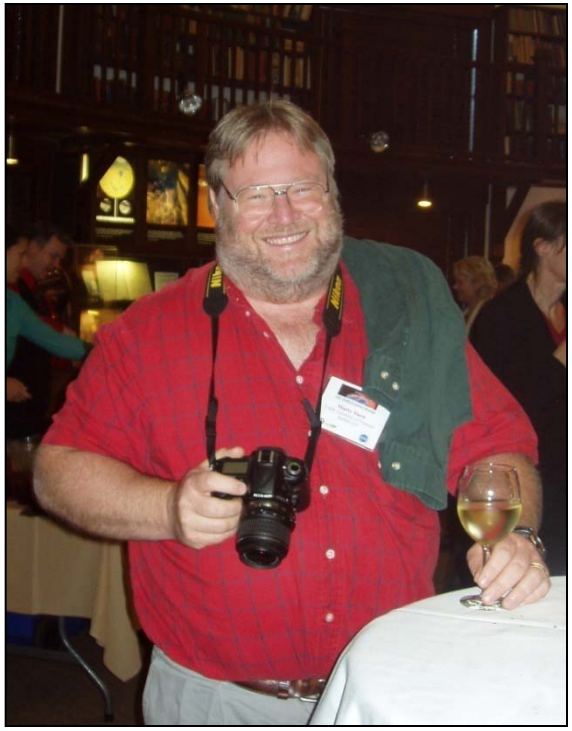
> > Delores Knipp (HAO/NCAR) smiles for photographer Marty Snow during one of the breaks.



^ ^ Marty Snow (LASP) was the official meeting photographer in addition to giving his talk on *Rotational Variability in the UV SSI.*

Note: Most of the photos in this newsletter were taken by Marty Snow.

> > Matthieu Kretzschmar (CNRS, Univ. of Orleans, France) explored *Solar Irradiance Variations during Solar Rotations.*

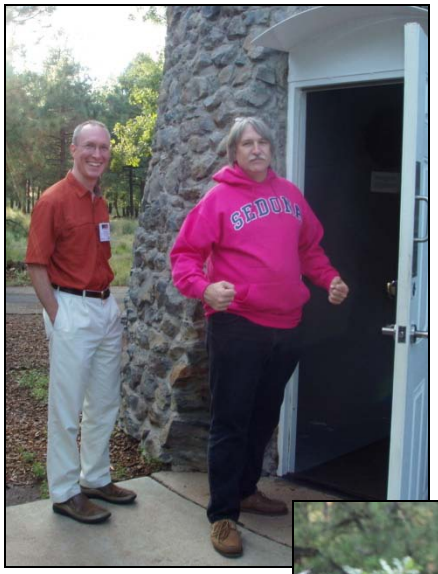
SORCE Science Meeting Dinner/Fieldtrip –

After a day of interesting talks, the group continued the science discussions while visiting the **Lowell Observatory** in Flagstaff, a beautiful 45-minute ride through spectacular Oak Creek Canyon. Lowell hosted the group on a tour of the facilities, where they learned about Lowell's contributions as one of the major U.S. astronomical research sites. Using various telescopes, Lowell Observatory plays an important role in advancing our knowledge of the solar system and beyond.

> > Wes Lockwood (Lowell Obs.) led one of the tour groups. Wes was on the 2011 SORCE Meeting Organizing Committee and helped to make the Lowell Observatory special event happen. Thank you Wes and Lowell!

< < Gary Chapman (California State Univ.) enjoys the view before boarding the bus for Lowell Observatory.

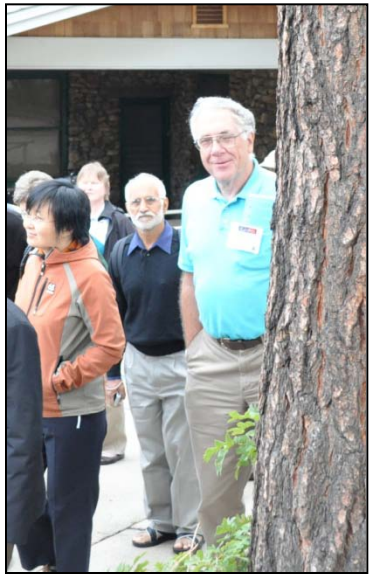
Phil Judge on his way to look at one of the many telescopes. v v

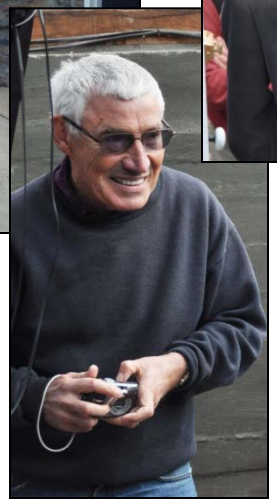


< < Left to right : Bill Swartz (JHU/APL) and Jeff Morrill (NRL) sporting his daughter's new "Sedona" sweatshirt.

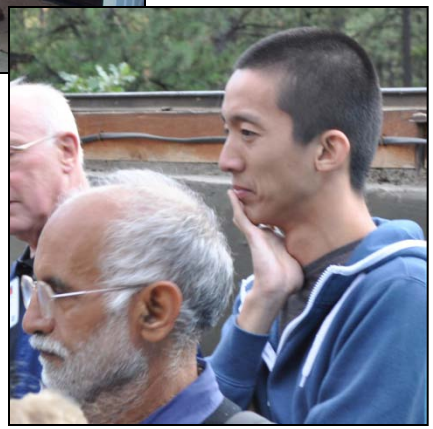
^ ^ Dick White (LASP/CU) .

Ken Tapping and the group enjoyed the informative tour. v v





< < Alexander Ruzmaikin (NASA/JPL).



>> Left to right: Hari Om Vats and Kok Leng Yeo (Max Planck Inst., Germany). Kok Leng gave a poster presentation on *HMI/SDO Magnetograms.*

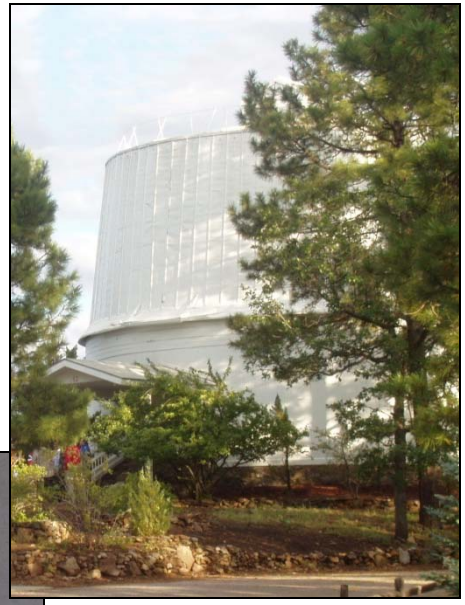
The tour included a close-up look at one of the telescopes used by Percival Lowell. And later to end a perfect evening, the skies cleared after dark and attendees were able to do some star-gazing through one of Lowell's oldest telescopes – The Clark Telescope Dome.

< < Joan Feynman had an interesting tie to the Lowell Observatory telescope. She shared a story about her brother Richard Feynman's connection to Lowell Observatory.

^ ^ The Lowell EPO tour guides were very helpful answering all of the group's questions.

< < Leif Svalgaard (retire from Stanford).

^ ^ Don McMullin (NRL).



^ ^ The Clark Telescope Dome, where attendees were able to enjoy the evening star-gazing.

< < Joan Feynman (NASA/JPL) .

Following the tour, attendees enjoyed a reception in the Rotunda (pictured below), and then enjoyed a fabulous dinner catered by a local favorite – the *Cottage Place Restaurant.* To end a perfect evening, the skies cleared after dark and attendees were able to do some star-gazing through one of Lowell's oldest telescopes.

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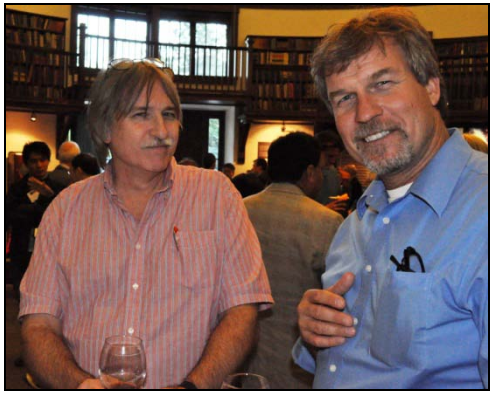
Tom Ayres talks to Jeff Hall (right) , the Director of the Lowell Observatory since Dec. 2010. Due to Jeff's busy schedule, this year's SORCE Meeting is one of the first SORCE Meetings that he has missed.

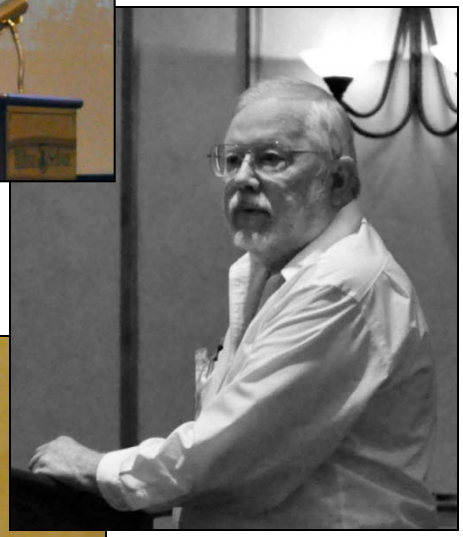


The final day of the SORCE Meeting, Friday, Sept. 16, featured **Session 6.** ***Modeling and Forecasting Solar Cycles and Climate Impacts.*** Speakers included Keynote Speaker Kyle Swanson, Bob Cahalan, Bill Swartz, King-Fai Li, Gary Chapman, Nicola Scafetta, Judith Lean, Madhulika Guhathakurta, Ken Tapping, Peter Pilewskie, and Tom Woods.

> > Ken Tapping (Herzberg Inst.) explained *The Next Generation in Solar Radio Monitoring.*

< < Kyle Swanson (Univ. of Wisconsin – Madison) kicked off Session 6 with a keynote talk on *Climate Regime Shifts.*

^ ^ Tom Woods (LASP) closed the session with *Solar Irradiance Variations during SC 24.*



Judith Lean (NRL) dazzled attendees with her colorful presentation on *Forecasting Climate and Ozone Changes on Multi-Decadal Time Scales.* v v

^ ^ Lika Guhathakurta (NASA Hdqts.) shared the latest in *Heliophysics Research in LWS/ILWS.*

^ ^ Gary Chapman (California State Univ.) presented *Modeling TSI Variations from SORCE/TIM.*

< < Bill Swartz (JHU/APL) humorously educated participants on *Decadal Variability in the Atmosphere.*

Summary and Conclusion

To conclude the SORCE Meeting PI Tom Woods came full circle by addressing the key questions that the attendees had hoped to tackle during the previous 3.5 days.

The SORCE team extends a hearty thanks to all participants for making the 2011 SORCE Science Team Meeting a success!

What can we learn about decadal climate response and climate sensitivity using the SC as a well-specified external radiative forcing?

- Quasi 2-year periods in ocean and atmosphere oscillations (ENSO, NAO, and QBO) may have a link to solar variations, but in complicated and non-linear ways. The solar maximum and declining phase appear more clearly.
- Both bottom-up (surface/ocean heating) and top-down (UV atmosphere heating) contribute to the solar influence on climate.

What is current understanding of the amplitude of solar spectral variability and the response of the Earth's atmosphere and climate system?

- SSI short-term (27-day rotation) variability is understood well; however there is much to do towards resolving differences between measurements and models regarding long-term variability. There is a SSI Validation Workshop in the planning stages for spring 2012.

How does TSI vary over the SC and what are the implications for climate modeling to recent refinements in its magnitude?

- There has been great progress in resolving the TSI level differences.
- TSI variations clearly include sunspot darkening and faculae brightening components and *perhaps* a longer-term component.

How do comparisons with Sun-like stars improve our understanding of solar variability?

- The Sun appears to be much like other older G stars in some ways and yet it appears unique in many other respects.
- Stellar dynamo modeling is in a new phase of dazzling results with high-end computing and yet the solar dynamo is elusive.

How can solar and climate models be advanced to better reproduce decadal variability and improve forecast capabilities?

- A better understanding of the complex climate system is expected to lead to improved forecast accuracy.
- Some of the challenges are clouds and aerosols (large uncertainties) and energy imbalance / missing energy.
- The recent solar cycle minimum challenges the Maunder Minimum results.

For complete 2011 Meeting information visit –
http://lasp.colorado.edu/sorce/news/2011ScienceMeeting/index.html.
The agenda, abstracts, summary, presentations, and photo gallery are on-line!