SNS – SORCE News Source

Solar Radiation and Climate Experiment Monthly Newsletter **June 2010**

SORCE Science Meeting Summary – "Solar and Anthropogenic Influences on Earth: The Current Solar Minimum and Predictions for Future Decades"

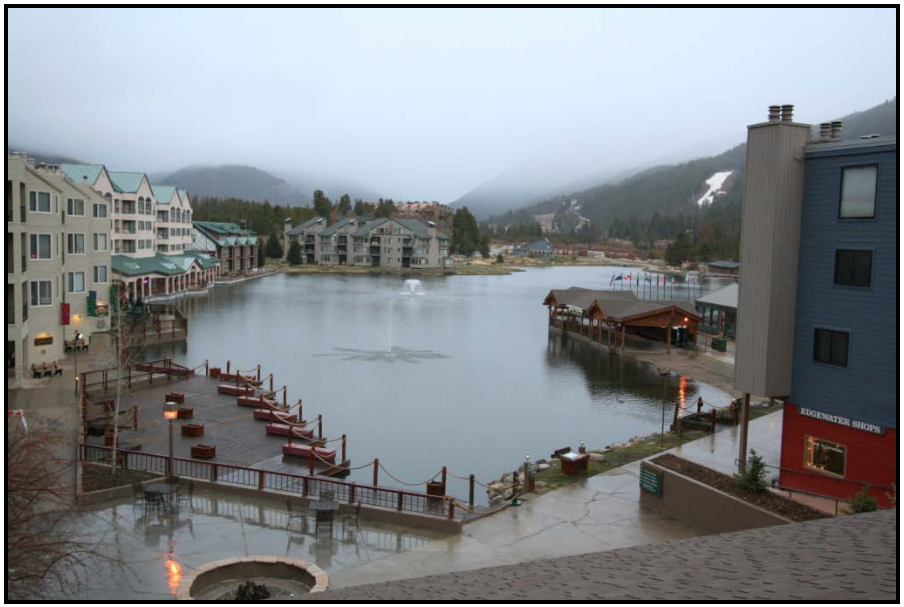
Approximately 80 scientists gathered for the 2010 Solar Radiation and Climate Experiment (SORCE) Science Team Meeting, ***Solar and Anthropogenic Influences on Earth: The Current Solar Minimum and Predictions for Future Decades,*** May 19-21, in Keystone, Colorado. The discussions covered a wide range of current solar and earth science research. A summary of the meeting, including .pdf versions of the many excellent presentations, is available at: http://lasp.colorado.edu/sorce/news/2010ScienceMeeting/index.html. ("Meetings" are under "News and Events" on the SORCE main web page.)

Photo by Richard Stolarski.

Introduction and Meeting Overview

Relative to the past three solar minimum epochs of the space era (1976, 1986, and 1996) the current solar minimum (2008–2009) between Solar Cycles 23 and 24 was unusually prolonged with record numbers of sunspot-free days, record low solar polar magnetic fields, and record high levels of cosmic ray flux. Evidence is accumulating that there have been broad ranging terrestrial responses to the extended inactivity of the Sun. In the upper atmosphere and ionosphere, temperatures are anomalously cool and densities are reduced relative to previous solar minima; but these changes may also be related to accumulated greenhouse gas cooling in the upper atmosphere.

Keystone Village Lake view – plenty of snow yet in the Colorado peaks in mid May. *Photo by Rich Stolarski.*



Keystone Village Lake view – Although mostly sunny, attendees did get to experience a typical spring Colorado snowfall early one morning. (It really was beautiful!) *Photo by David Hathaway.*

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

- Are spectral and total solar irradiance levels lower now than during past minima, and how much will they increase during SC 24?
- Can we identify anomalous behavior in the solar dynamo and surface flux transport to help understand the recent minimum?
- How are heliospheric changes altering incident cosmic ray fluxes and the Earth's near-space environment?
- Can we reliably discern the terrestrial signatures of the recent minimum – at the surface, in the stratosphere, and in space weather?

The SORCE Meeting got underway with a Welcoming Reception on Tuesday evening, May 18. This reception began just as a special afternoon session in honor of Oran R. (Dick) White concluded. Dick's gathering was titled, ***Where did the first 50 years go?***

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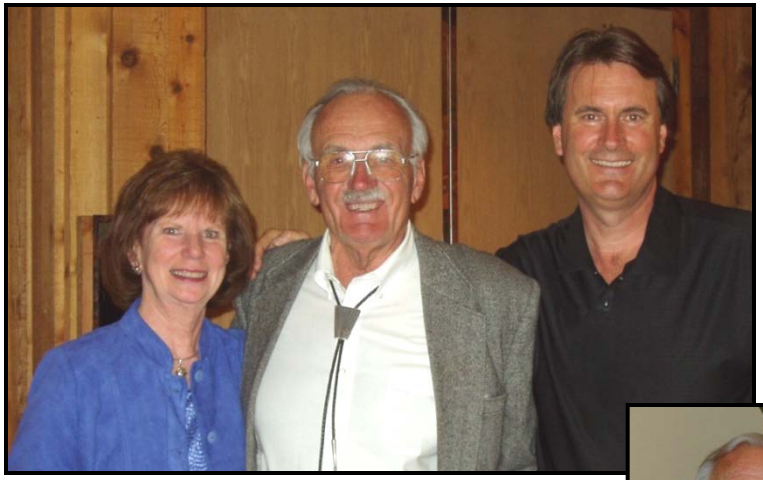
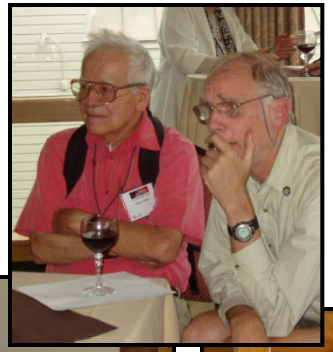
Gary Rottman (LASP), original SORCE PI, organized the Dick White celebration. He concluded Dick's session with a talk on Dick's work collecting solar irradiance data from space.

^ ^ Dick enjoys a laugh with Ernie Hildner (NOAA SWPC).



^ ^ Dick White surrounded by his wife, Patricia Johnson, and his son, Will White, following a celebration of Dick's contributions to solar physics.



< < Dale Vrabec (Estes Park, CO) and Charlie Lindsey (NWRA CoRA) attended the afternoon seminar.

Dick Willson (JPL) and Dick White setting aside all TSI discussions.
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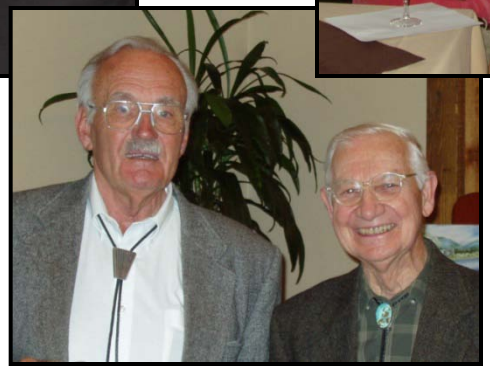

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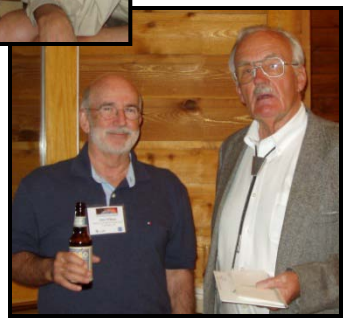
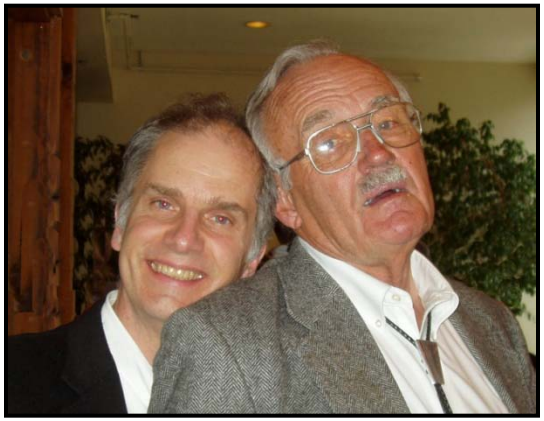
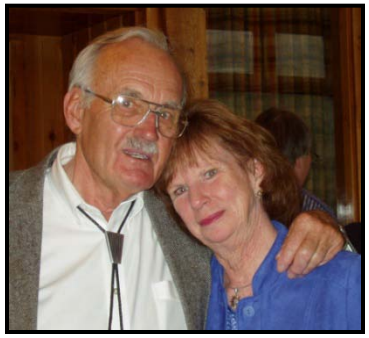
Dick and Andy Skumanich, an old friend from HAO/NCAR.



Kim Malville (CU) and Bill Livingston (NOAO NSA) enjoy a laugh after they each gave talks at Dick's celebration. Kim talked about his and Dick's graduate school years together and Bill talked about the ground-based work at KPSO and SPO they shared. V V



< < Tom Bogdan (NOAA SWPC) and Dick White pose for the photographer. Tom gave a talk at Dick's recognition reviewing Dick's years at the High Altitude Observatory, NCAR.



^ ^ Semi-retirement is good!

^ ^ Tom Woods (LASP , SORCE PI) opened and closed the 2010 SORCE Meeting. *Photo by Gary Chapman.*

Wednesday morning Tom Woods, SORCE Principal Investigator, kicked-off the SORCE Science Meeting with a welcome and meeting introduction. There were 8 speakers in **Session 1. *TSI: Comparison of Solar Cycle Minima and Recent Validation Results,*** including Keynote Speaker David Hathaway, Dick Willson, Claus Fröhlich, Wolfgang Finsterle, Devendra Lal, Steven Dewitte, Greg Kopp, and Alexander Shapiro.

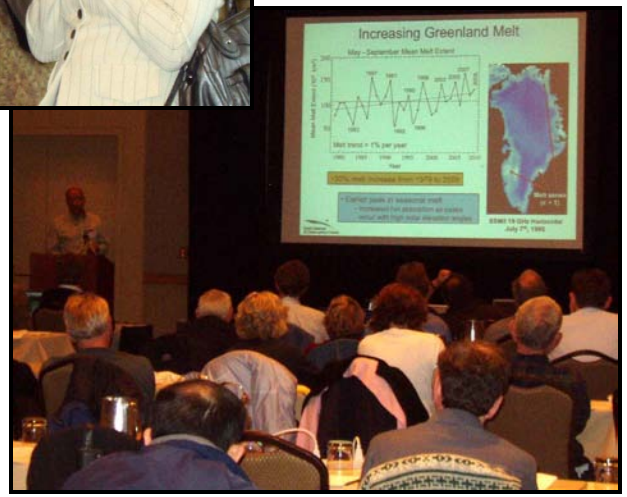
Wolfgang Finsterle (left) and André Fehlmann attended the SORCE Meeting on behalf of PMOD/WRC in Davos, Switzerland. > >

< < Matt DeLand (left, SSAI) and Greg Kopp (LASP, SORCE TIM instrument scientist).

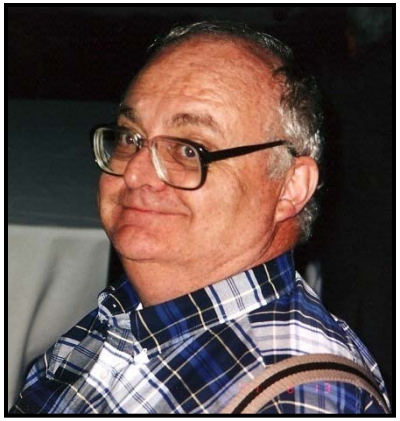
< < Dick Willson (NASA JPL) and Judit Pap (NASA GSFC). Dick presented *The Satellite TSI Database,* in Session 1.

> > Session 1 Keynote Speaker David Hathaway (left, NASA Marshall) talks with Charles Lindsey (CoRA NWRA) . David's opening talk was *Meridional Flow Variations: Implications for flux transport models.*

Chaired by Peter Pilewskie, **Session 2. *Climate Changes: What's the Future Going To Be?*** began with Keynote Speaker Georg Feulner (Potsdam Inst., Germany), who described Sun-climate interactions. The session closed with Waleed Abdalati,who researches ice sheet response to climate.



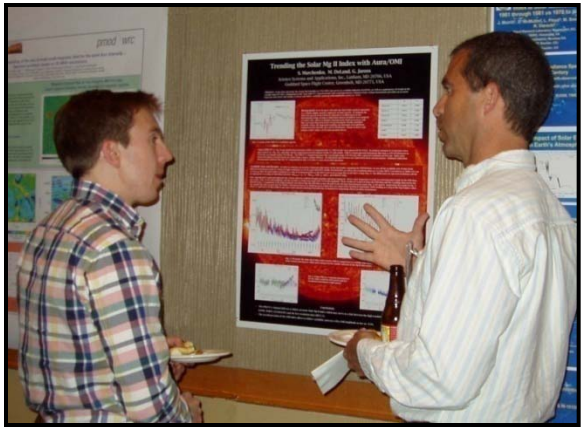
^ ^ Waleed Abdalati (CIRES, CU) presented *Ice Sheet Responses to Past and Current Climate Forcings.*



^ ^ Richard (Dick) Donnelly was remembered for his contributions to the solar-terrestrial community.

Session 3. ***SSI: Solar Cycle Variation and Model Comparisons*** began with Session Chair Tom Woods giving a short tribute to Richard (Dick) Donnelly, who passed away in August of 2009. Donnelly was a physicist at NOAA/SEC for 30 years where he made significant contributions to the solar-terrestrial community. The session continued with 7 speakers, including Jerry Harder, Will Ball, Matt DeLand, Cassandra Bolduc, Tom Woods, Jeffrey Hall, and Gérard Thuillier.

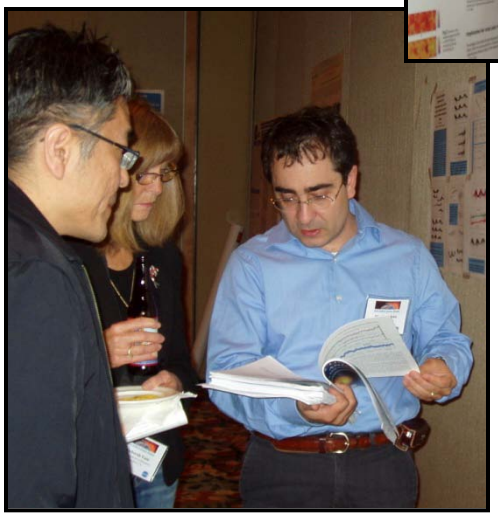
A special **Poster Session** featuring over 20 posters completed the first day of the meeting. Attendees enjoyed refreshments while they wandered through the poster area and discussed their content with the authors.



^ ^ Will Ball (left, Imperial College, UK) and Matt DeLand (SSAI) both gave presentations in Session 3.

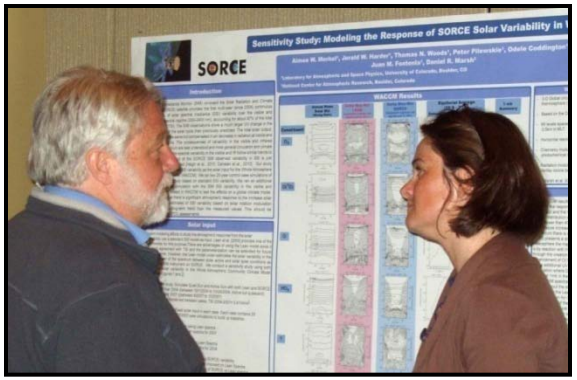
> > Graduate student Jean-François Cossette (Univ. of Montreal) explains his poster to Gérard Thuillier (LATMOS-CNRS, France). This year's meeting drew more students than ever before.

< < Margit Haberreiter (LASP, CU) talks with (left to right) Wolfgang Finsterle (PMOD), Phil Judge (HAO, NCAR), and Gary Rottman (LASP, CU) about the two posters she presented.



< < Nicola Scafetta (Duke Univ.) shares his research with Yi-Ming Wang (NRL) and Deborah Vane (JPL).

< < Faithful SORCE Meeting attendee Angie Cookson (California State Univ.) presented a poster, *Choosing a TSI Composite for Examining Solar Minima.*



> > Aimee Merkel (LASP, CU) discusses her research on modeling the SORCE solar variability into WACCM with Bob Cahalan (NASA GSFC).

The second meeting day began with Rich Stolarski, Joanna Haigh, Ka-Kit Tung, and Robert Cahalan handling **Session 4.** ***Atmospheric and Ozone Changes: Has the Ozone Recovery Started Yet?*** Before Session 5 began, Bob Cahalan, who chaired both Sessions 4 and 5, presented a thoughtful tribute to John Allen "Jack" Eddy who passed away in June 2009. Cahalan acknowledged that Jack was extremely influential in solar physics. There was open audience participation and fond reflections from many of Jack's former colleagues over a long and uniquely interdisciplinary scientific career.

Session 5. ***Space Weather Effects Observed During This Solar Cycle Minimum*** included 5 speakers – John Emmert, Liying Qian, Eduardo Araujo-Pradere, Giuliana deToma, and David Webb.

^ ^ John Allen "Jack" Eddy.

^ ^ Michael King (CU) and Rich Stolarski (NASA GSFC) were part of the lively conversation at the SORCE Meeting. Rich's Session 4 talk was *Impact of Solar Variability on Ozone and Temperature.*

< < Dora Preminger (California State Univ.) and Ralph Kahn (NASA GSFC) discuss her poster, *Different Models of TSI: Are they compatible with each other and with spacecraft composites?*

> >
Giuliana deToma (HAO, NCAR) listens to Dick Willson (JPL).

Typical Colorado weather… the group watched the snow gently fall in the morning, but then enjoyed lunch outdoors on a sunny patio at the Keystone Conference Center.
Photo by Rich Stolarski. v v

^ ^ Left to right, Gérard Thuillier (LATMOS-CNRS), Steven Dewitte (Royal Meteor. Inst., Belgium), Leif and Vera Svalgaard (Stanford), and Eva Robbrecht (Royal Obs., Belgium) enjoyed the Poster Reception.
Photo by David Hathaway.

^ ^ Left to right, Tom Woods (LASP, CU), Joan Feynman (JPL), Claus Fröhlich (PMOD, WRC), Dick White (LASP, CU), and Bill Livingston (NOAO NSO). *Photo by Rich Stolarski.*

Thursday afternoon was **Session 6.** ***Solar Physics: What Do We Learn About the Sun from this Unique Cycle Minimum,*** which Keynote Speaker Dick White kicked-off. He was followed by talks given by Eva Robbrecht, Ken Tapping, Leif Svalgaard, Paul Charbonneau, Mausumi Dikpati, Joan Feynman, and graduate student Andrés Muñoz-Jaramillo.

After a full day of interesting talks, the group continued the day's science discussions during a special dinner at the beautiful ***Keystone Ranch,*** a local favorite just up the valley. The warm ambiance in this historical 1930's homestead, delicious Colorado cuisine, and perfect evening temperatures to enjoy the back patio mountain view set the stage for in-depth science debate into the evening.

^ ^ Eva Robbrecht (Royal Obs., Belgium) presented *The Weak Polar Fields of SC 23. Photo by David Hathaway.*

^ ^ Lika Guhathakurta (NASA Hdqts.) and George Lawrence (LASP, CU) catching up. *Photo by David Hathaway.*

^ ^ *The Keystone Ranch* – a historical 1930's homestead. *Photo by Rich Stolarski.*

The view off The Keystone Ranch back patio. *Photo by Rich Stolarski.* V V

< < Gary Chapman (California State Univ.) and his wife enjoying their time at the dinner. Gary presented a poster called *The Quiet Sun TSI During 2009. Photo by David Hathaway.*

< < David Webb (Boston College) and Alexander Ruzmaiken (JPL) having fun for the photographer. *Photo by David Hathaway.*

The final day, May 21, featured **Session 7. *Recommendations for the Future: How to Improve the Climate Data Record?*** Speakers included Keynote Speaker John Bates, Peter Pilewskie, Madhulika Guhathakurta, and Dean Pesnell.

< < Dean Pesnell (NASA, GSFC) gave an update on the Solar Dynamics Observatory, SDO. *Photo by Rich Stolarski.*

^ ^ Left to right, Rock Bush (Stanford Univ.), Tom Woods (LASP, CU), and Lika Guhathakurta (NASA Hdqts.). Lika's Session 7 presentation was on the Living With A Star program. *Photo by David Hathaway.*

Summary and Conclusion

Tom Woods wrapped up the meeting by summarizing the presentations and science discussions that had occurred over the previous 2.5 days. The workshop raised several intriguing questions that we may hope to answer as we embark on a new solar cycle with unprecedented new measurement capabilities.

What is the long-term trend in TSI observations?

The recent trends at current solar cycle minimum suggest that the solar Modern Maximum period might be on the decline. Continued observations by SORCE TIM and new TSI measurements from NASA Glory, ESA SOLAR, and ESA PICARD are expected to continue the TSI record into SC 24.

What is the solar cycle variation in the near-infrared (NIR)?

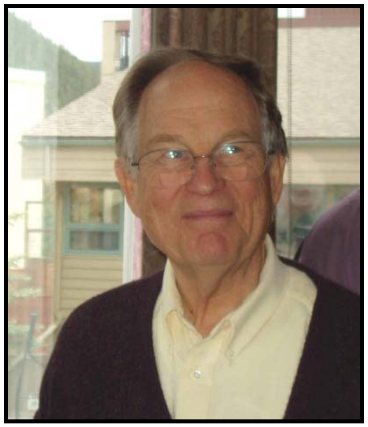
The SORCE SIM data yield an inverse relationship with solar cycle that is higher near infrared levels during cycle minimum. New validation is anticipated for the SSI measurements with the ESA SOLAR instruments on the ISS.

How big will Solar Cycle 24 be?

There are interesting, but conflicting, predictions for both high and low levels for the next maximum in 2012-2013. Time will tell which prediction, if any, is correct.

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

Our next gathering will be in Fall 2011.



^ ^ George Lawrence (LASP, CU) ponders the intriguing concluding SORCE Meeting questions.

For complete 2010 Meeting information visit – http://lasp.colorado.edu/sorce/news/2010ScienceMeeting/index.html. The agenda, abstracts, summary, and presentations are on-line!