

## *Sun-Climate Symposium*

### *“Multi-Decadal Variability in Sun and Earth during the Space Era”*

Nov. 10-13, 2015 \* Savannah, Georgia

#### **Agenda and Presentations**

(as of Nov. 4, 2015)

#### **Monday, November 9**

5:30 – 7:00 pm **Welcoming Reception – Marriott Riverfront**

#### **Tuesday, November 10**

7:30 – 8:30 am **Continental Breakfast**

8:15 – 8:30 am **Welcome/Introduction**

**Peter Pilewskie and Tom Woods**, LASP, University of Colorado, Boulder

8:30 – 9:10 am **Symposium Kick-off Keynote**

**Gary Rottman**, LASP, University of Colorado, Boulder

*Validity of Today's Solar Irradiance Measurements to Future (100 Years) Climate Studies*

#### **Session 1.**

#### **Total Solar Irradiance (TSI) Measurements and Modeling**

*Chair: Tom Woods, LASP, University of Colorado, Boulder*

9:10 – 9:35 am **Kok Leng Yeo**, Max Planck Institute for Solar System Research, Göttingen, Germany

*SATIRE-S Reconstruction of TSI and SSI since 1974*

9:35 – 9:50 am **Frédéric Clette**, WDC – SILSO, Royal Observatory of Belgium, Brussels

*New Re-Calibrated Sunspot Numbers and the Past Solar Output*

9:50 – 10:05 am **Stijn Nevens**, Royal Meteorological Institute of Belgium, Brussels

*TSI Reconstruction over the Last 300 Years*

10:05 – 10:30 am **Gary Chapman**, San Fernando Observatory, California State University, Northridge

*Modeling TSI Variations using Photometric Images from the San Fernando Observatory*

10:30 – 11 am **Break**

11:00 – 11:25 am **Odele Coddington**, LASP, University of Colorado, Boulder

*A New Record of Total Solar Irradiance from 1610 to Present*

11:25 – 11:40 am **Claus Fröhlich**, Davos Wolfgang, Switzerland

*TSI and Ly- $\alpha$  Reconstruction Back to 1915 Based on Sunspot Area from RGO, Ca-II Data from Mt. Willson and the 4-Component Proxy Model Calibrated 1978-2015*

11:40 – 11:55 am **Werner Schmutz (presented by Will Ball)**, PMOD / World Radiation Center (WRC), Davos, Switzerland

*The PREMOS/PICARD TSI Record: Comparison to other instruments and the 2013/2014 TSI-composite*

11:55 – 12:10 pm **Steven Dewitte**, Royal Meteorological Institute of Belgium, Brussels

*The Value of the Solar Constant*

12:10 – 12:25 pm **Greg Kopp**, LASP, University of Colorado, Boulder

*Wanted: A TSI Measurement Record*

12:25 – 12:40 pm **Thierry Dudok de Wit**, LPC2E, CNRS and University of Orléans, France

*Making of Composites out of Multiple Observations: The New TSI and MgII Index Composites*

**12:40 – 2:00 pm**    **Lunch (provided at the Marriott)**

**Session 2.    Sun-Climate Connection: Top-down and bottom-up couplings**

*Chair: Dong Wu, NASA GSFC, Greenbelt, MD*

**2:00 – 2:25 pm**    **Anne K. Smith**, Atmospheric Chemistry Observations & Modeling / NCAR, Boulder, CO  
*Interpreting Correlation and Multi-Regression Analyses of Solar Cycle Impacts*

**2:25 – 2:50 pm**    **Andrew Kren**, NOAA, Global Systems Division (GSD), Boulder, CO  
*The Response of the Stratosphere to the 11-Year Solar Cycle, the Quasi-Biennial Oscillation, and the Pacific Decadal Oscillation*

**2:50 – 3:05 pm**    **Chihoko Cullens**, University of California, Berkeley  
*The 11-Year Solar Cycle Signature on Wave-Driven Dynamics in WACCM*

**3:05 – 3:20 pm**    **Kalevi Mursula**, ReSoLVE CoE, Space Physics Unit, University of Oulu, Finland  
*Why Does the Positive Phase of NAO Pattern Appear Preferentially in the Declining Phase of the Solar Cycle?*

**3:20 – 3:50 pm**    **Break**

**3:50 – 4:15 pm**    **James Russell III**, Center for Atmospheric Sciences, Hampton University, Hampton, VA  
*Validation of the Global Distribution of CO<sub>2</sub> Volume Mixing Ratio in the Mesosphere and Lower Thermosphere from SABER*

**4:15 – 4:30 pm**    **Jia Yue**, Center for Atmospheric Sciences, Hampton University, Hampton, Virginia  
*Increasing Carbon Dioxide Concentration in the Upper Atmosphere Observed by SABER*

**4:30 – 4:45 pm**    **Ales Kuchar**, Charles University in Prague, Czech Republic; and Institute for Atmospheric and Climate Science ETH, Zurich, Switzerland  
*Attribution of the 11-year solar cycle in lower-stratospheric temperature and ozone*

**4:45 – 5:00 pm**    **Guoyong Wen**, NASA GSFC, Greenbelt, MD; and Morgan State University, Baltimore, MD  
*Surface Temperature and Planetary Albedo Responses to Total and Spectral Solar Forcing on Multi Decadal Time Scales in GISS GCMAM*

**5:00 – 5:15 pm**    **Yukihiko Takahashi**, Dept. of CosmoSciences, Hokkaido Univ., Sapporo, Hokkaido, Japan  
*Relationship Between Solar Parameters and Typhoon/Thunderstorm Occurrences with One-Month Periodicity*

**Wednesday, November 11**

**7:30 – 8:30 am**    **Continental Breakfast**

**Session 3.    Climate Changes during the Space Era**

*Chair: Odele Coddington, LASP, University of Colorado, Boulder*

**8:15 – 8:55 am**    **Keynote: Drew Shindell**, Duke University, Durham, NC  
*Solar Forcing of Industrial Era Climate Change*

**8:55 – 9:20 am**    **Norm Loeb**, NASA Langley Research Center, Hampton, VA  
*Earth's Radiation Imbalance Observed from Space*

**9:20 – 9:35 am**    **Alex Ruzmaikin**, NASA Jet Propulsion Lab., California Inst. of Technology, Pasadena, CA  
*Solar Forcing of the Earth's Climate on Multi-Decadal Time Scales*

**9:35 – 9:50 am**    **Pavle Arsenovic**, Institute for Atmospheric and Climate Science, ETH, Zurich, Switzerland  
*Climate and Ozone Layer in the Future: Implications of Grand Solar Minimum*

**9:50 – 10:20 am**    **Break**

- 10:20 – 10:45 am** **Rolando Garcia**, Atmospheric Chemistry Observations & Modeling/NCAR, Boulder, CO  
*Trends and Solar Cycle Signals of CO and CO<sub>2</sub> in the MLT*
- 10:45 – 11:10 am** **John Emmert**, Naval Research Laboratory (NRL), Washington, DC  
*Past and Future Climate of Thermospheric Density: Solar and anthropogenic influences*

#### **Session 4. Solar Spectral Irradiance (SSI) Measurements and Modeling**

*Chair: Robert Cahalan, APL, Johns Hopkins University, Laurel, MD*

- 11:11 – 11:35 am** **William Ball**, Physikalisch-Meteorologisches Observatorium / WRC, Davos, Switzerland  
*New Results on the Stratospheric Ozone Response to Solar Spectral Irradiance Variability*
- 11:35 – 11:50 am** **Jerald Harder**, LASP, University of Colorado, Boulder  
*Construction of a SORCE-Based Solar Spectral Irradiance (SSI) Record for Input into Chemistry Climate Models*
- 11:50 – 1:00 pm** **Lunch (provided at the Marriott)**
- 1:00 – 1:25 pm** **James Butler**, NASA GSFC, Greenbelt, MD  
*SSI Requirements for Earth Observing Sensors Operating in the UV to Shortwave*
- 1:25 – 1:40 pm** **Matthieu Kretzschmar**, LPC2E, CNRS and University of Orléans, France  
*On the Stability of Solar Spectral Irradiance Records*
- 1:40 – 2:05 pm** **Ken Tapping**, National Research Council, Herzberg Inst. of Astrophysics D.R.A.O.,  
Penticton, BC, Canada  
*Using F10.7 and Other Activity Indices to Examine Continuity of Solar Activity Cycles*
- 2:05 – 2:30 pm** **Scott McIntosh**, High Altitude Observatory/NCAR, Boulder, CO  
*Quasi-Periodic Variations in Radiative Output Driven By Activity Band Interactions*
- 2:30 – 2:45 pm** **Sergey Marchenko**, SSAI, Lanham, MD; and NASA GSFC  
*Spectral Irradiance Changes in Cycle 24: Inter-comparing Aura/OMI, SORCE SIM, and SORCE SOLSTICE*
- 2:45 – 3:00 pm** **Gérard Thuillier**, LATMOS, France  
*SOLSPEC onboard the International Space Station: Absolute Solar Spectral Irradiance in the Infrared Domain and Comparison with Recent Solar Models*
- 3:00 – 3:30 pm** **Break**
- 3:30 – 3:45 pm** **Courtney Peck**, LASP, University of Colorado, Boulder  
*Demonstrating the Sensitivity of Long-Term Photometric Trends to the Center-to-Limb Profile*
- 3:45 – 4:10 pm** **Eugene Avrett**, Harvard-Smithsonian Center for Astrophysics, Boston, Massachusetts  
*Modeling of the Solar Atmosphere: Spectral Irradiance Synthesis for the Period 2010-2015*
- 4:10 – 4:25 pm** **Cassandra Bolduc**, PMOD / WRC, Davos, Switzerland  
*NLTE Calculation of the Solar spectrum with Cross-influence of solar Atmospheric structures (SOC RAT)*
- 4:25 – 4:40 pm** **Tom Woods**, LASP, University of Colorado, Boulder  
*A Different View of Solar Spectral Irradiance Variations: Modeling Total Energy over Six-Month Intervals*
- 4:40 – 4:55 pm** **Jae Lee**, University of Maryland, Baltimore County; and NASA GSFC, Greenbelt, MD  
*Solar Rotational Modulations of Spectral Irradiance and Correlations with the Variability of Total Solar Irradiance*

#### **Science Dinner – Savannah Riverboat**

**6:00 pm Riverboat Boarding, 7:00 pm Cruise/Dinner, 9:00 pm Return to dock**

## Thursday, November 12

7:30 – 8:30 am **Continental Breakfast**

### Session 5. **Societal Impacts from Climate Change and Solar Variability**

*Chair: Greg Kopp, LASP, University of Colorado, Boulder*

8:15 – 8:55 am **Keynote: Bruce Wielicki**, NASA Langley Research Center, Hampton, VA  
*Climate Change Accuracy: Observing Requirements and Economic Value*

8:55 – 9:20 am **Robert Cahalan**, APL, Johns Hopkins University, Laurel, MD  
*Atlantic Coastal Impacts of Global Warming*

### Session 6. **Variability of the Sun-like Stars**

*Chair: Doug Rabin, NASA GSFC, Greenbelt, MD*

9:20 – 10:00 am **Keynote: Jeff Hall**, Lowell Observatory, Flagstaff, AZ  
*The Art of Science and the Physics of Sun-Like Stars*

10:00 – 10:25 am **Hugh Hudson**, Space Sciences Laboratory (SSL), University of California, Berkeley  
*The Sun and the Kepler Solar-Type Stars: Quiescence and Flaring*

10:25 – 10:55 am **Break**

10:55 – 11:20 am **Phil Judge**, High Altitude Observatory/NCAR, Boulder, CO  
*Heinrich Schwabe's Holistic Detective Agency*

11:20 – 11:45 pm **Tom Ayres**, CASA, University of Colorado, Boulder  
*The Ups and Downs of Alpha Centauri and Friends*

11:45 – 12:00 pm **Wes Lockwood**, Lowell Observatory, Flagstaff, AZ  
*Photometric Variations of 290 Sun-Like Stars 1993-2015*

12:00 – 2:00 pm **Lunch (on your own)**

### Session 7. **Challenges and Opportunities in Solar Observations**

*Chair: Jerry Harder, LASP, Univ. of Colorado, Boulder*

2:00 – 2:25 pm **Luc Damé**, Laboratoire Atmosphères, Milieux, Observations Spatiales (LATMOS), France  
*SUITS/SWUSV: A Solar-Terrestrial Space Weather & Climate Investigation*

2:25 – 2:40 pm **Martin Snow**, LASP, University of Colorado, Boulder  
*The EUV and X-ray Irradiance Sensors (EXIS): GOES-R and Beyond!*

2:40 – 2:55 pm **Marek Stęślicki**, Space Research Centre, Polish Academy of Sciences, Warsaw, Poland  
*Bragg Soft X-rays Spectrometers: Our future missions*

2:55 – 3:10 pm **Serena Criscuoli**, National Solar Observatory, Boulder, CO  
*Modeling Solar Irradiance with DKIST*

3:10 – 3:30 pm **Break**

3:30 – 3:45 pm **Candace Carlisle**, NASA GSFC, Greenbelt, MD  
*Total and Spectral solar Irradiances Sensor (TSIS) Project Overview*

3:45 – 4:00 pm **Erik Richard**, LASP, University of Colorado, Boulder  
*A Compact Solar Spectral Irradiance Monitor for Future Small Satellite and CubeSat Science Opportunities*

4:00 – 4:15 pm **William Swartz**, APL, Johns Hopkins University, Laurel, MD  
*The RAVAN CubeSat Mission: Progress toward a new measurement of Earth outgoing radiation*

- 4:15 – 4:30 pm** **Tom Sparn**, LASP, University of Colorado, Boulder  
*Continuous Constellation for Total and Spectral Solar Irradiance in the next 35 Years*
- 4:30 – 4:45 pm** **Matt DeLand**, SSAI, Lanham, MD; and NASA GSFC, Greenbelt, MD  
*Overview of the NASA Solar Irradiance Science Team (SIST) Program*
- 4:45 – 6:30 pm** **POSTER Session / Reception**

## **Friday, November 13**

- 7:30 – 8:30 am** **Continental Breakfast**
- Session 8.** **Next Generation Observing Systems for Climate Records**  
*Chairs: Erik Richard and Marty Snow, LASP, Univ. of Colorado, Boulder*
- 8:15 – 8:55 am** **Keynote: Hank Revercomb**, University of Wisconsin – Madison  
*The CLARREO Climate Benchmarking Mission: The Absolute Radiance Interferometer (ARI) is a proven prototype for the Infrared portion of the full observing capability*
- 8:55 – 9:10 am** **Peter Pilewskie**, LASP, University of Colorado, Boulder  
*The Earth Climate Hyperspectral Observatory: Advances in Climate Change Detection, Attribution, and Remote Sensing*
- 9:10 – 9:25 am** **Martin Mlynczak**, NASA Langley Research Center, Hampton, Virginia  
*Long-Term Observations of the Upper Atmosphere*
- 9:25 – 9:50 am** **David Crisp**, NASA Jet Propulsion Laboratory (JPL), Pasadena, California  
*Early Results from the First Year of Operations of the OCO-2 Mission*
- 9:50 – 10:20 am** **Break**
- 10:20 – 10:45 am** **Graeme Stephens**, NASA JPL and California Institute of Technology, Pasadena, CA  
*An Active Approach to Climate Data Records*
- 10:45 – 11:10 am** **Alexander Marshak**, NASA GSFC, Greenbelt, MD  
*Looking at the Entire Sunlit Earth from the L1 Point; The very first results*
- 11:10 – 11:25 am** **Ricky Egeland**, High Altitude Observatory, NCAR, Boulder, CO  
*Century-Long Monitoring of Solar Irradiance and Earth's Albedo Using a Stable Scattering Target in Space*
- 11:25 – 11:40 am** **Dong Wu**, NASA GSFC, Greenbelt, MD  
*What Spatiotemporal Sampling is Needed to Determine Earth Radiation Imbalance from GEO-MEO-LEO Constellation?*
- 11:40 – 12:05 pm** **Cheryl Yuhas**, NASA Headquarters, Washington, DC  
*Overview of the Current and Future Missions for NASA's Earth Science Division*
- 12:05 – 12:30 pm** **Meeting Wrap-Up**  
**Marty Snow**, LASP, University of Colorado, Boulder

## **Poster Session** (*Thursday, Nov. 12, 4:45 – 6:30 pm*)

- 1) **Serena Criscuoli**, National Solar Observatory, Boulder, CO  
*Relation between Intensity Contrast and Magnetic Field for Active and Quiet Regions Observed on the Solar Photosphere*
- 2) **Sarah Blunt**, Brown University, Providence, Rhode Island  
*Intensity Contrasts of Bright Solar Surface Features in Continuum and Absorption Bands at Disk Center*
- 3) **Angela Cookson**, San Fernando Observatory, California State University, Northridge  
*Sunspots: SFO Areas vs. SILSO's Revised Sunspot Numbers*
- 4) **Andrés Muñoz-Jaramillo**, Georgia State University, Atlanta  
*Vitalizing Four Solar Cycles of Kitt Peak Synoptic Magnetograms*
- 5) **Jenny Marcela Rodriguez Gómez**, INPE, San Jose dos Campos, Brazil  
*Modeling Electron Density, Temperature Distribution in the Solar Corona Based on Solar Surface Magnetic Field Observations*
- 6) **N. Brice Orange**, Orange Wave Innovative Science, LLC; and University of the Virgin Islands  
*Magnetic Energy Coupling Across Broad Solar Atmospheric Plasma Conditions and Temperature Scales*
- 7) **Thierry Dudok de Wit**, LPC2E, CNRS University of Orléans, France  
*Forecasting Solar Forcing Up to 2300: Why, and How?*
- 8) **Claus Fröhlich**, Davos, Switzerland  
*Photometric Sunspot Index 1875 to Present, an Update*
- 9) **Wolfgang Finsterle**, Physikalisch-Meteorologisches Observatorium / WRC, Davos, Switzerland  
*The Calibration of the CLARA Radiometer*
- 10) **Benjamin Walter (presented by Wolfgang Finsterle)**, PMOD / WRC, Davos, Switzerland  
*Terrestrial Solar Irradiance Measurements with a Cryogenic Solar Absolut Radiometer*
- 11) **Greg Kopp**, LASP, University of Colorado, Boulder  
*The Four Flight Total Irradiance Monitors*
- 12) **Mustapha Meftah**, Laboratoire Atmosphères, Milieux, Observations Spatiales (LATMOS), France  
*Evolution of the TSI during the Rising Phase of SC 24*
- 13) **Jae Lee**, University of Maryland, Baltimore County; and NASA GSFC, Greenbelt, MD  
*Comparison of OLR Datasets from AIRS, CERES, and MERRA2*
- 14) **Tom Woods**, LASP, University of Colorado, Boulder  
*Technology Advances Enable Science-Oriented CubeSat Missions*
- 15) **Alexander Shapiro (presented by Kok Leng Yeo)**, Max Planck Institute for Solar System Research, Göttingen, Germany  
*Connecting Solar and Stellar Brightness Variations*
- 16) **Stéphane Béland**, LASP, University of Colorado, Boulder  
*The Latest SORCE SIM Degradation Model and the Resulting SSI Measurements from 2003 to 2015*
- 17) **Martin Snow**, LASP, University of Colorado, Boulder  
*SORCE Undergraduate Researchers*
- 18) **Janet Machol (presented by Martin Snow)**, CIRES, University of Colorado, Boulder; and NOAA National Centers for Environmental Information (NCEI), Boulder, CO  
*Exospheric Hydrogen Density Determined from Lyman- $\alpha$  Irradiance*
- 19) **Linda A. Hunt**, Science Systems and Applications Inc. (SSAI), Hampton, VA  
*A Combined Solar and Geomagnetic Index for Thermospheric Climate*