



2009 cal con

CALCON TECHNICAL CONFERENCE

AUGUST 24 TO 27, 2009 ■ SESSIONS ■ POSTERS

Utah State University Eccles Conference Center, Logan, Utah, USA

WELCOME TO THE 18TH ANNUAL CONFERENCE ON CHARACTERIZATION AND RADIO-METRIC CALIBRATION FOR REMOTE SENSING. We hope you find the oral and poster presentations informative and interesting. We encourage you to take advantage of this time to discuss ideas and challenges, make new contacts, and foster existing relationships. Thank you for joining us.

CONFERENCE PRESENTERS

The Speaker Ready Room is located in Room 212. Speakers must deliver their presentation to be uploaded to the server on or before the day and time specified below:

Monday Speakers:	Due by Monday	12:30 PM
Tuesday Speakers:	Due by Monday	3:00 PM
Wednesday Speakers:	Due by Tuesday	3:00 PM
Thursday Speakers:	Due by Wednesday	3:00 PM

SESSION CHAIRS & PRESENTERS

All speakers are required to attend an audiovisual meeting with the technician and session chairs. This is your opportunity to be trained with the audio visual equipment as well as meet your session chair. You are required to attend the meeting on the day of your presentation. Audiovisual meetings will be held in Auditorium Room 216 at the following times:

Monday Speakers & Session Chairs:	Monday	12:30–1:00 PM
Tuesday Speakers & Session Chairs:	Tuesday	7:30–7:55 AM
Wednesday Speakers & Session Chairs:	Wednesday	7:30–7:55 AM
Thursday Speakers & Session Chairs:	Thursday	7:30–7:55 AM

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VISIT THE CONFERENCE WEBSITE

www.spacedynamics.org/conferences/calcon

LOCATION: The Pre-Conference Tutorial and all conference sessions will be held in the Eccles Conference Center on the Utah State University Campus.

MONDAY, AUGUST 24, 2009

- 7:30 AM–8:30 AM Registration
- 8:30 AM–12:00 PM **Pre-Conference Tutorial:** Optical and Microwave Calibration for Remote Sensing
- 12:00 PM–1:15 PM Registration
- 1:15 PM–1:30 PM Conference Welcome
- 1:30 PM–3:20 PM **Technical Session:** Calibration of Microwave Radiometers and Other Microwave Instruments
- 3:20 PM–3:50 PM Refreshment Break
- 3:50 PM–6:00 PM **Technical Session:** Calibration Methods for Climate Change Measurement and Modeling
- 6:30 PM–8:30 PM **Opening Social** at the Space Dynamics Laboratory

TUESDAY, AUGUST 25, 2009

- 7:30 AM–8:15 AM Continental Breakfast
- 8:15 AM–9:45 AM **SPOTLIGHT Session:** NPOESS
- 9:45 AM–10:35 AM Poster Viewing / Refreshment Break
- 10:35 AM–12:15 PM **SPOTLIGHT Session:** NPOESS (cont.)
- 12:15 PM–1:15 PM Lunch Provided
- 1:15 PM–2:15 PM **Keynote Introduction and Address**
- 2:15 PM–3:45 PM **Technical Session:** Calibration Methods Using Celestial Objects
- 3:45 PM–4:15 PM Refreshment Break
- 4:15 PM–5:35 PM **Technical Session:** Calibration Methods Using Celestial Objects (cont.)
- 6:00 PM–8:15 PM LBIR User’s Board Meeting
Free Evening

WEDNESDAY, AUGUST 26, 2009

- 7:30 AM–8:00 AM Continental Breakfast
- 8:00 AM–10:10 AM **Technical Session:** National Standards Technology Advancement
- 10:10 AM–10:40 AM Poster Viewing / Refreshment Break
- 10:40 AM–1:15 PM **SPOTLIGHT Session:** GOES-R
- 1:15 PM–2:15 PM Lunch Provided
- 2:15 PM–3:45 PM **Technical Session:** Equipment, Capabilities, and Facilities for Radiometric Calibration
- 3:45 PM–4:15 PM Refreshment Break
- 4:15 PM–5:15 PM **Technical Session:** Equipment, Capabilities, and Facilities for Radiometric Calibration (cont.)
- 6:00 PM–8:30 PM **Barbeque** in Logan Canyon (Guinavah-Malibu Campground Group Site C)

THURSDAY, AUGUST 27, 2009

- 7:30 AM–8:00 AM Continental Breakfast
- 8:00 AM–10:30 AM **Technical Session:** Pre-Launch Testing and Post-Launch Performance
- 10:30 AM–11:00 AM Refreshment Break
- 11:00 AM–1:15 PM **SPOTLIGHT Session:** CLARREO
- 1:15 PM–2:00 PM Lunch Provided
- 2:00 PM–3:50 PM **Technical Session:** Inter-Calibration and Validation of Operational Sensors
- 3:50 PM–4:05 PM Break
- 4:05 PM–7:00 PM US-Only Session

*Conference schedule is based on information available at the time of publication and is subject to change.

8:30 AM–12:00 PM

OPTICAL AND MICROWAVE CALIBRATION FOR REMOTE SENSING

This year's tutorial consists of two main topics for those new to remote sensing or those moving from one section of the electromagnetic spectrum to another. The first half of the tutorial will review those microwave principals fundamental to understanding the operation and calibration of microwave sensors (radiometers and radars) for remote sensing. The second half will cover those optical principals fundamental to understanding the operation and calibration of EO/IR sensors for remote sensing. Comparisons between these two portions of the spectrum will be addressed to show the complementary nature of these sensors, as well as indicating when one type of sensor has significant advantages over the other.

FUNDAMENTALS FOR MICROWAVE SENSOR CALIBRATION

Randy Jost, USU/Space Dynamics Laboratory

Dr. Randy J. Jost is a member of the special projects division at the Space Dynamics Laboratory (SDL). He has over 25 years of experience in the field of microwave measurements including the design of instrumentation grade radar measurement systems for low radar returns and developing calibration and measurement standards for RCS measurement systems. Before coming to SDL he was the technical manager at the National RCS Test Facility where he was instrumental in the development of the national RCS certification standardization program. Currently he is very active in the development of standardized calibration and measurement approaches for DoD optical and RF measurement systems.

■ **MICROWAVE TARGETS/SIGNATURES**

- Continuous media and the atmosphere
- Interaction of microwaves with discrete objects
- Scattering and emissions from volumes
- Scattering and emissions from smooth surfaces
- Scattering and emissions from rough surfaces

■ **MICROWAVE APPLICATIONS**

- Atmospheric sounding
- Passive imaging
- Active imaging
- Interferometry

■ **CALIBRATION OF MICROWAVE SENSORS**

- Calibration of radiometers
- Calibration of radars

■ **DETECTION OF MICROWAVES—MICROWAVE SENSORS**

- Passive—radiometers
- Active—radars

■ **MICROWAVES VS. OPTICAL RADIATION**

- Phase and coherence
- Microwave radiometry
- Microwave propagation

FUNDAMENTALS FOR OPTICAL RADIOMETRIC SENSOR CALIBRATION

David Pollock, University of Alabama, Huntsville

Associate Research Professor, Electrical Computer Engineering, and Senior Research Scientist, Center for Applied Optics. He is internationally recognized for his efforts in Remote Sensor Calibration to produce Climate Data Records of an adequate quality to assess global climate change. He has played an active role in the organization and execution of the annual Calibration Conferences held at Utah State University since 1989. An essential element of his work is a thorough understanding of Physics and Physics based models for the radiation, propagation and detection of electromagnetic energy. He holds six patents and has presented more than 80 technical papers. He has an MS (Optical Sciences), 1983; MS (Physics), 1962; and a BS (Physics), 1960.

■ **RADIOMETRY FUNDAMENTALS**

- The Poynting vector
- A-Omega product (throughput)
- Phase errors
- Index of refraction
- Projected solid angle
- Spatial resolution
- Information content

■ **PHYSICS-BASED OBSERVATION MODELING**

- Calibration source spectral radiance
- Unknown source spectral radiance
- Unknown spectral radiance of the intervening medium

■ **PHYSICS-BASED SENSOR MODELING**

- The calibration equation
- Spatial information bandwidth and content
- Temporal information bandwidth and content
- Photo-transducer (detector) focus
- Noise sources

■ **RADIOMETRIC UNCERTAINTY**

- Accuracy
- Precision
- The International System of Units (SI)
- Competing SI accuracies

MONDAY, AUGUST 24

1:30 PM–3:20 PM

CALIBRATION OF MICROWAVE RADIOMETERS AND OTHER MICROWAVE INSTRUMENTS

Session Co-chairs: Fuzhong Weng, NOAA/NESDIS/Center for Satellite Applications and Research and Dave Kunkee, NOAA/IPO/Aerospace

Address the calibration and characterization issues associated with making radiometric measurements within the microwave band, including the comparison or fusion of microwave data with data obtained within the optical bands.

- **Residual Scan Biases Observed in Operational Conical and Cross Track Microwave Sounding Channels Using Numerical Weather Prediction and Data Assimilation Systems**
Steve Swadley, Gene Poe—Naval Research Laboratory; Nigel Atkinson—The Met Office; Prabodh Patel—Northrop Grumman Electronic Systems
- **An Overview of ATMS Characterization and Post-Launch Cal/Val Planning**
William Blackwell, Vince Leslie—MIT Lincoln Laboratory
- **Special Sensor Microwave Imager (SSM/I) Intersensor Calibration and Impacts on EDRs and CDRs**
Song Yang, Ninghai Sun—IMSG at NOAA/NESDIS; Fuzhong Weng—NOAA/NESDIS/Center for Satellite Applications and Research; Mitch Goldberg—NOAA/NESDIS/STAR; Banghua Yan—QSS at NOAA/NESDIS
- **ATMS xDR Error Modeling**
Laura Bickmeier, William Blackwell, Laura Jairam, Vince Leslie, Michael Pieper, Jenna Samra—MIT Lincoln Laboratory
- **Assimilation Impact of F16 SSMIS Data on National Centers for Environmental Prediction Global Forecast System**
Banghua Yan—Joint Center for Satellite Data Assimilation; Fuzhong Weng—NOAA/NESDIS/Center for Satellite Applications and Research

3:50 PM–6:00 PM

CALIBRATION METHODS FOR CLIMATE CHANGE MEASUREMENT AND MODELING

Session Co-chairs: Daniel Bancroft, Frontier Technology, Inc. and Mark Larsen, USU/Space Dynamics Laboratory

Climate-quality radiometric measurements require very stringent calibration precision and accuracy. This session presents methods and techniques that are capable of meeting the requirements of climate change measurement and modeling programs, and describes calibration results for sensors designed to achieve climate-quality measurement results.

Decadal Climate Change, Climate Prediction, and the Role of Satellite Calibration

Bruce Wielicki—NASA Langley Research Center

- **Initial Results of Aperture Area Comparisons for Exo-atmospheric Total Solar Irradiance Measurements**
B. Carol Johnson, Maritoni Litorja, Joel Fowler—NIST; Robert Barnes—Science Applications International Corp.; James Butler—NASA Goddard Space Flight Center
- **Clouds and the Earth's Radiant Energy System (CERES) FM5 on NPP: Pre-flight Calibration Results**
Suzanne Maddock, Susan Thomas—Science Systems and Applications, Inc.; Melody Avery, Kory Priestley—NASA Langley Research Center
- **Developing AVHRR Lunar Calibration for Climate Change Detection**
Changyong Cao—NOAA/NESDIS/STAR; Xiaoxiong Xiong—NASA Goddard Space Flight Center
- **Climate-quality Calibration Stability Using the Moon as a Reference**
Thomas Stone—US Geological Survey
- **Comparison of Earth Radiation Budget Measurements: Past, Present and Future**
Lou Smith—National Institute of Aerospace; Kory Priestley—NASA Langley Research Center

OPENING SOCIAL 6:30 PM TO 8:30 PM

The Space Dynamics Laboratory invites you to attend the Opening Social for the CALCON Technical Conference

USU Research Foundation/Innovation Campus Pond
1695 North Research Park Way, North Logan, Utah



Space Dynamics
LABORATORY
Utah State University Research Foundation



TUESDAY, AUGUST 25

8:15 AM–9:45 AM

SPOTLIGHT SESSION—NPOESS

Session Chair: Bruce Guenther, NPOESS Data Products Division, Integrated Program Office

Pre-launch Characterization of NPP VIIRS Response versus Scan-angle

Jack Xiong, Jim Butler—NASA Goddard Space Flight Center; Chunhui Pan, Sam Xiong—SSAI

- **VIIRS Polarization Re-testing**

Eugene Waluschka—NASA; Leibo Ding—SSAI

- **On-Orbit Calibration of the VIIRS Day/Night Band (DNB)**

Steve Mills, Stephanie Weiss, Tohru Ohnuki, Jackie Jaron, Don Searcy, Mike Plonski—Northrop Grumman Aerospace Systems

- **Usefulness of Flight like Characterization of the CrIS Sensor**

Mark Esplin, Gail Bingham—USU/Space Dynamics Laboratory

10:35 AM–12:15 PM

SPOTLIGHT SESSION—NPOESS (CONT.)

Session Chair: Bruce Guenther, NPOESS Data Products Division, Integrated Program Office

- **Measurements of the Atmospheric Emitted Radiance Interferometer (AERI) Blackbody Emissivity and Radiance Using Multiple Techniques**

Fred Best, Robert Knuteson, Henry Revercomb, Dave Tobin, Jonathan Gero, Joe Taylor—University of Wisconsin, Space Science and Engineering Center; Joe Rice, Leonard Hanssen, Sergey Mekhontsev—NIST

- **Analysis Of The Cris Flight Model 1 Radiometric Linearity And Radiometric Uncertainty**

Joe Taylor, David Tobin, Henry Revercomb, Robert Knuteson, Lori Borg, Fred Best—University of Wisconsin, Space Science and Engineering Center

- **Independent Assessment of the CrIS SDR Algorithm: Radiometric Calibration**

Vladimir Zavyalov, Mark Esplin, Gail Bingham, Chad Fish, Tim Neilsen, Nikita Pougatchev, Marc Struthers, B.J. Randall—USU/Space Dynamics Laboratory

- **NPOESS MIS Radiometric Calibration Error Analysis**

Justin Bobak, Peter Gaiser—Naval Research Laboratory

- **Reflective Solar Band Calibration Uncertainty Analysis for the Nonlinear Attenuator Method**

Carl Fischer, William Bicknell—MIT Lincoln Laboratory

1:15 PM–2:15 PM

KEYNOTE SPEAKER ABIGAIL (ABBY) D. HARPER

Deputy Assistant Administrator, Systems; National Environmental Satellite, Data, and Information Service (NESDIS); National Oceanic and Atmospheric Administration (NOAA)



In May 2007, Ms. Harper began serving as the National Environmental Satellite, Data, and Information Service (NESDIS) Deputy Assistant Administrator, Systems. She is responsible for the overall policy direction, coordination, and management of the National Oceanic & Atmospheric Administration's (NOAA's) satellite acquisitions, including the ground systems. In this role, she also coordinates NOAA's system engineering, mission assurance, and acquisition activities with the National Aeronautics and Space Administration (NASA), the Department of Defense, other Federal agencies, and the private sector.

Before joining NOAA, Ms. Harper was the Assistant Systems Program Manager for the Geostationary Operational Environmental Satellite Series R (GOES-R) at NASA. She provided systems engineering and programmatic support for the NOAA Systems Program Director. In that role, she also supported the development of business and technical structures and provided oversight of risk reduction and procurement efforts.

Ms. Harper has diverse experience in space development, from mission assurance, to systems engineering, and to program/project management, for both earth and space science missions. As the Acting Director & Deputy Director of Systems Safety & Mission Assurance at NASA's Goddard Space Flight Center, she was responsible for ensuring the development and application of rigorous processes for mission success.

She holds a Master of Science in Mechanical Engineering from George Washington University; a Bachelor of Science in General Engineering from the University of Illinois; and a year of bioengineering study at the University of Sussex in Sussex, England.

2:15 PM–3:45 PM

CALIBRATION METHODS USING CELESTIAL OBJECTS

Session Co-chairs: Keith Lykke, NIST and Tom Stone, US Geological Survey

Focus on radiometric measurements and calibration methods using the Sun, Moon, stars, and other celestial objects in the ultraviolet, visible, and infrared wavelengths.

■ ACCESS: Enabling an Improved Flux Scale for Astrophysics

Mary Elizabeth Kaiser, Jeffrey Kruk, Stephan McCandliss, David Sahnou, W. Van Dixon, Paul Feldman, H. Warren Moos—Johns Hopkins University; Bernard Rauscher, Randy Kimble, Dominic Benford, Jonathan Gardner, Bruce Woodgate—NASA Goddard Space Flight Center; Ralph Bohlin, Susana Deustua, Adam Riess—Johns Hopkins University, Space Telescope Science Institute; Robert Kurucz—Harvard Smithsonian Center for Astrophysics; Michael Lampton—Space Sciences Laboratory; Saul Perlmutter—University of California, Berkeley; Edward Wright—University of California, Los Angeles

■ The Cosmic Infrared Background Experiment

Michael Zemcov, James Bock, John Battle—Jet Propulsion Lab/California Institute of Technology; Keith Lykke, Allan Smith, Steven Brown—NIST; Takehiko Wada, Shuji Matsuura, Toshio Matsumoto, Kohji Tsumura—Japan Aerospace Exploration Agency (JAXA)—ISAS; Ian Sullivan, Viktor Hristov, Andrew Lange, Peter Mason—California Institute of Technology; Brian Keating, Tom Renbarger—University of California, San Diego; Asantha Cooray—University of California, Irvine; Dae Hee Lee, Uk Won Nam—KASI

■ Observations of On-orbit Calibration Spheres and Calibration Stars with the Broadband Array Spectrograph System (BASS)

Mark Skinner, Stephen Gregory—The Boeing Company; Ray Russell, Richard Rudy, David Gutierrez, Daryl Kim, Kirk Crawford, Brandon Kaneshiro—The Aerospace Corporation

■ Star-based Calibration Technics for PLEIADES-HR Satellites

Sebastien Fourest, Laurent Lebegue—CNES

4:15 PM–5:35 PM

CALIBRATION METHODS USING CELESTIAL OBJECTS (CONT.)

Session Co-chairs: Keith Lykke, NIST and Tom Stone, US Geological Survey

■ Long-term Stabilization of LDCM Products Using the Moon

Hugh Kieffer—Celestial Reasonings

■ Using Lunar Observations for MODIS Thermal Emissive Bands Characterization

Jack Xiong—NASA Goddard Space Flight Center; Tiejun Chang, Sergey Marchenko—SSAI/MCST, NASA Goddard Space Flight Center

■ The Cross Calibration of SeaWiFS and MODIS Using On-Orbit Observations of the Moon

Gene Eplee—Science Applications International Corporation; Jack Xiong, Charles McClain—NASA Goddard Space Flight Center; Jun-Qiang Sun—Science Systems and Applications, Inc.; Gerhard Meister—Futurtech Corporation

■ Comparison of GOES Imager Visible Channel Lunar and Star Calibration

Xiangqian Wu—NOAA/NESDIS/STAR; Charles Dean—Perot Systems Corporation; Michael Weinreb—Riverside Technology, inc.; Fangfang Yu—ERT, Inc.; I-Lock Chang—American University, Perot Systems Corporation; Gordana Sindic-Rancic—IMSG, Inc.; Zhenping Li—SGT, Inc.; Kenneth Mitchell, Dejiang Han—ARSC Aerospace Corporation; Thomas Stone—US Geological Survey

WEDNESDAY, AUGUST 26

8:00 AM–10:10 AM

NATIONAL STANDARDS TECHNOLOGY ADVANCEMENT

Session Co-chairs: Eric Shirley, NIST and Kim Slack, ITT

Address ways in which national standards laboratories and the calibration community are collaborating to improve calibration technologies and methodologies.

■ Comparison of the Total Solar Irradiance Radiometer Facility Cryogenic Radiometer Against the NIST Primary Optical Watt Radiometer

Joseph Rice, Allan Smith—NIST; Greg Kopp, David Harber, Karl Heuerman—University of Colorado/LASP; Steven Lorentz—L-1 Standards and Technology

WEDNESDAY, AUGUST 26

- **Validation of the Glory TIM Instrument Calibration in the TSI Radiometer Facility**
David Harber, Karl Heuerman, Ginger Drake, Greg Kopp—University of Colorado/LASP
- **Characterization, Calibration and Performance Validation of Imaging Sensors at NIST: the SIRCUS Facility**
Steven Brown, Allan Smith, Keith Lykke, John Woodward—NIST; Dan Walker—Aerospace Corporation; Robert Lambeck—NASA; Bruce Guenther—NOAA
- **High-accuracy Telescope Calibration Facility at NIST**
John Woodward, Allan Smith, Keith Lykke—NIST; Colleen Jenkins—USU/Space Dynamics Laboratory; Chungsan Lin—Jung Research and Development Corp.
- **Final Results of a Nationwide Inter-laboratory Comparison of Infrared Reflectance**
Leonard Hanssen, Boris Wilthan—NIST
- **The New NIST Radiance and Radiation Temperature (R2T) Calibration Facility**
Howard Yoon, Charles Gibson—NIST

10:40 AM–1:15 PM

SPOTLIGHT SESSION—GOES-R

Session Co-chairs: Changyong Cao, NOAA/NESDIS/STAR and Roy Galvin, ITT

- **Pre-launch Calibration and Post-launch Characterization of the GOES-R Satellite System**
Steven Goodman, Gregory Mandt, Hal Bloom—NOAA/NESDIS GOES-R Program Office; Changyong Cao—NOAA/NESDIS/STAR; Bob Iacovazzi—ERT/NOAA; Dennis Cheslers—NASA Goddard Space Flight Center/Flight Segment Project
- **An Overview of the GOES-R Calibration/Validation Plan**
Changyong Cao—NOAA/NESDIS/STAR; Bob Iacovazzi—ERT/NOAA
- **Pre-launch Cal/Val Support for the GOES-R Program: The SIRCUS Role**
Allan Smith, Steven Brown, Keith Lykke—NIST
- **Calibration of the Geostationary Lightning Mapper (GLM)**
Hugh Christian—RDR
- **Determination of Infrared Filter Spectral Response Functions**
Simon Kaplan, Leonard Hanssen—NIST
- **Post-Launch Correction of GOES-13 Imager 13.3 mm Channel Spectral Response Function**
Xiangqian Wu—NOAA/NESDIS/STAR; Timothy Schmit, Matthew Gunshor—University of Wisconsin, Cooperative Institute for Meteorological Satellite Studies
- **Selection of Vicarious Calibration Sites for GOES-R ABI Solar Bands**
Ping Jing—IMSG at NOAA/NESDIS/STAR

2:15 PM–3:45 PM

EQUIPMENT, CAPABILITIES, AND FACILITIES FOR RADIOMETRIC CALIBRATION

Session Chair: Kendall Johnson, USU/Space Dynamics Laboratory

Address equipment, capabilities, and facilities that may be used for radiometric calibration, including long-term trending and performance enhancements.

- **IR3—A New Tool for Infrared Responsivity and Reflectance Measurements**
Sergey Mekhontsev, Leonard Hanssen—NIST; Vladimir Khromchenko—USU/Space Dynamics Laboratory
- **Satellite-Mounted Light Sources as Photometric Calibration Standards for Ground-Based Telescopes**
Justin Albert—University of Victoria; William Burgett—Institute for Astronomy, University of Hawaii; Jason Rhodes—NASA Jet Propulsion Laboratory; James Battat—Massachusetts Institute of Technology
- **Characterization of a Heliostat Facility for Solar-radiation-based Calibration of Earth Observing Sensors**
Sandra Collins, William Good, Paul Kaptchen, Tony Lin, Raymund To, Michelle Narciso—Ball Aerospace & Technologies Corp.
- **Characterization of Spectral Response Functions for Clouds and Earth's Radiant Energy System (CERES) Instrument Sensors**
Mohan Shankar, Susan Thomas—Science Systems and Applications, Inc.; Kory Priestley—NASA Langley Research Center

4:15 PM–5:15 PM

EQUIPMENT, CAPABILITIES, AND FACILITIES FOR RADIOMETRIC CALIBRATION (CONT.)

Session Chair: Kendall Johnson, USU/Space Dynamics Laboratory

- **SDL-XR (Space Dynamics Laboratory Transfer Radiometer)**
Kendall Johnson, Alan Thurgood, Joe Tansock—USU/Space Dynamics Laboratory
- **Calibration of a Hyperspectral Image Projector**
Joseph Rice—NIST
- **The Extension of the NIST Bidirectional Reflectance Distribution Function from 1100 nm to 2500 nm**
David Allen, Howard Yoon—NIST

THURSDAY, AUGUST 27

8:00 AM–10:30 AM

PRE-LAUNCH TESTING AND POST-LAUNCH PERFORMANCE

Session Chair: Jim Butler, NASA Goddard Space Flight Center

Assess pre- and post-launch calibration and performance characterization for operational remote sensing systems.

- **EOS-Aura OMI In-flight Performance and Calibration and Sentinel-5 Precursor TROPOMI On-ground Calibration**
Marcel Dobber, Q. Kleipool, P.F. Levelt—Royal Netherlands Meteorological Institute (KNMI); R. Snel—Space Research Organisation Netherlands; G. Otter—TNO Science and Industry; J. de Vries—Dutch Space BV
- **Radiometric Calibration Techniques for the OMPS Instruments**
Stephen Bennett—Ball Aerospace & Technologies Corp.
- **The Atmospheric Infrared Sounder (AIRS) Sensitivity Measurement (NESR) and Model**
Charles Dionne, Kenneth Overoye—BAE Systems
- **WISE Mission and Payload Overview**
Mark Larsen, Joel Cardon, Harri Latvakoski, Kirk Larsen, John Elwell—USU/Space Dynamics Laboratory
- **WISE Ground Characterization Overview**
Joel Cardon, Harri Latvakoski, Mark Larsen—USU/Space Dynamics Laboratory
- **Wide-Field Infrared Survey Explorer (WISE) Relative Spectral Response Calibration**
Scott Hansen, Harri Latvakoski, Pedro Sevilla, Joel Cardon, Mark Larsen—USU/Space Dynamics Laboratory
- **Focusing WISE**
Harri Latvakoski, Roy Esplin, Mark Larsen, Joel Cardon—USU/Space Dynamics Laboratory

11:00 AM–1:15 PM

SPOTLIGHT SESSION—CLARREO

Session Co-chairs: Dave Young, NASA and Eric Shirley, NIST

- **CLARREO Visible and Near-Infrared Radiometry Studies**
Greg Kopp, Ginger Drake, Joey Espejo, David Harber, Karl Heuerman, Peter Pilewskie, Yolanda Roberts—University of Colorado/LASP; Joseph Rice, Howard Yoon—NIST
- **Error Budget Analysis for the Reflected Solar Instrument of CLARREO**
Kurtis Thome—NASA Goddard Space Flight Center
- **An Approach to Rigorous, Independent Verification of On-orbit Measurement Uncertainty**
John Dykema—Harvard University; Eric Shirley, Gerald Fraser—NIST
- **Opportunities for Achieving SI-Traceable Far-Infrared Radiance Measurements For Climate Change Detection**
Martin Mlynczak, David Johnson, David Young, Sharon Graves—NASA Langley Research Center; David Jordan—ITT; Michael Gritz—Raytheon; Gail Bingham—USU/Space Dynamics Laboratory; Simon Kaplan—NIST
- **Quantum Cascade Laser Based Reflectometry for On-orbit Blackbody Emissivity Measurements for CLARREO**
John Dykema, Mark Witinski, James Anderson—Harvard University; Johnathan Gero—University of Wisconsin, Space Science and Engineering Center
- **Minimizing Satellite Sampling Errors for Climate Monitoring**
Daniel Kirk-Davidoff, Benjamin Johnson, Renu Joseph—University of Maryland, College Park

THURSDAY, AUGUST 27

2:00 PM–3:50 PM

INTER-CALIBRATION AND VALIDATION OF OPERATIONAL SENSORS

Session Co-chairs: Bob Iacovazzi, ERT/NOAA and Xiangqian Wu, NOAA/NESDIS/STAR

Compare performance between sensors of differing scientific objectives, capabilities, and mission parameters to assess measurement bias and uncertainty.

- **Comparisons of Radiometry from the Atmospheric Infrared Sounder (AIRS) and the Infrared Atmospheric Sounding Interferometer (IASI) For Two Years of Data**
Hartmut Aumann, Denis Elliott—Jet Propulsion Lab/California Institute of Technology
- **Analysis of POES NOAA-14 MSU and NOAA-15 AMSU-A Relative Measurement Biases for Climate Change Detection**
Bob Iacovazzi—ERT/NOAA; Changyong Cao, Sid-Ahmed Boukabara—NOAA/NESDIS/STAR
- **Climate Calibration of the ISCCP Visible Record Using Deep Convective Clouds**
David Doelling, Paul Stackhouse, Patrick Minnis—NASA Langley Research Center; Rajendra Bhatt, Colleen Mikovitz—Science Systems & Applications, Inc.; Laura Hinkelman—University of Washington
- **Visible Channel Calibration of GOES Imager Using Deep Convective Clouds**
Sung-Rae Chung, Xiangqian Wu, Fangfang Yu—NOAA/NESDIS/STAR
- **Investigation of LSpec Autonomous Ground Calibration Site Using Terra MODIS and Landsat ETM+**
Matthew Polder, George Cipperly, Carey Davis, Ellis Freedman—Lockheed Martin

4:05 PM–7:00 PM

US-ONLY RESTRICTED SESSION

Session Co-chairs: Richard Williams, Northrop Grumman and Randy Nicholson, AEDC Aerospace Testing Alliance (ATA)

All presentations are ITAR/export controlled. Verification of US citizenship or permanent residency is required. Attendees must submit a Verification Form. Completed forms must be submitted prior to conference attendance. The form is available for download at www.spacedynamics.org/conferences/calcon/registration.

Analysis of Energy-on-Detector and Other Point-Response Parameters for Imaging Sensors Using the ASTIF Glenn Soberman—Northrop Grumman Electronic Systems

- **The Applicability of NIST and NASA Calibration Capabilities to GOES Solar Imagers**
Michael McGuirk—MIT Lincoln Laboratory; Charles Tarrío and Steven Grantham—NIST; Jonathan Certain—NASA Marshall Space Flight Center; Gustave Comeyne III—NOAA
- **Radiometric Calibration and Complex Scene Projection in the AEDC 7V Chamber Sensor Test Facility**
Randy Nicholson, Kimberly Mead, Heard Lowry, Sidney Steely, Henry Horne—AEDC Aerospace Testing Alliance (ATA)
- **Calibration and Characterization of the 10V Chamber Facility IR Sources Using the NIST BXR and the 10V Internal Radiometer (RCMS)**
Henry Horne, Randy Nicholson, Kimberly Mead, William Scott, Earl Kiech—AEDC Aerospace Testing Alliance (ATA)
- **3-Bounce Trap Internal Calibration Target for CrIS Flight Model 2**
Philip Blais, Frederick Williams, Ronald Glumb, Merritt Webb, Sheldon Stokes, David Smith – ITT Corporation
- **Neon Bulb Used as On-orbit Spectral Calibrator for CrIS FTS Sensor**
Joseph Predina, Tom Pappas, Ronald Glumb—ITT Corporation



POSTER SESSION

Posters presentations are displayed in room 207/205. Posters may be viewed during the continental breakfasts, lunches, and refreshment breaks. Authors present during the following times:

TUESDAY 9:45 AM–10:35 AM

WEDNESDAY 10:10 AM–10:40 AM

- **A Model of the Absolute Radiance of the Disk-Resolved Moon**

E. J. Kennelly—Atmospheric & Environmental Research, Inc.; S.D. Price, K.E. Kraemer—Air Force Research Laboratory

- ▶ **AMSU-A Instruments Long-term Calibration Stability Characteristics and Their Relations with Intersatellite Brightness Temperature Biases**

Wenhui Wang—I. M. Systems Group; Cheng-Zhi Zou—NOAA/NESDIS/STAR/SMCD

- ▶ **An Assessment of Pseudo-Invariant CEOS Reference Standard Test Sites for Stability Monitoring**

Gyanesh Chander—SGT, Inc., US Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center; Xiaoxiong Xiong—NASA Goddard Space Flight Center; Taeyoung Choi, Amit Angal—Science Systems and Applications, Inc.

- **A Space-based Calibration Transfer Standard Spectroradiometer (SCATS) for Validating SI Traceable CLARREO Benchmark Climate Measurements in the Solar Reflective Region**

Donald Heath, James Leitch, Richard Tarde—Ball Aerospace & Technologies Corp.

- **Calibration of the NIST Thermal-infrared Transfer Radiometer (TXR)**

Joseph Rice, Joseph O'Connell, Raju Datla—NIST

- **Cross-platform Consistency of AVHRR Nighttime Radiances Onboard NOAA 16-19 and MetOp-A Using the Monitoring of IR Clear-sky Radiances Over Oceans for SST (MICROS) Near-Real Time Web-based Tool**

XingMing Liang—NOAA/NESDIS/STAR & CSU/CIRA; Alexander Ignatov—NOAA/NESDIS/STAR

- **Design and Testing of an Upgraded Automated Solar Radiometer with TE-cooled SWIR Channels**

Nikolaus Anderson, Stuart Biggar, Jeffrey Czaplá-Myers, Joel McCorkel, Nathan Leisso—University of Arizona; Kurtis Thome—NASA Goddard Space Flight Center; Ronald Lockwood, Thomas Cooley—Space Vehicles Directorate, Air Force Research Laboratory

- **General Use of Celestial Body & Vicarious Calibration Metrics in Maintaining Earth Observing Radiometer Calibration Stability**

Grant Matthews—ITT

- **Generation and Validation of ATMS Proxy Data for CrIMSS Algorithm Testing**

Laura Jairam, Laura Bickmeier, William Blackwell, Vince Leslie—MIT Lincoln Laboratory

- **In-flight Radiometric and Geometric Calibration Plan for the Proba-V Mission**

Sindy Sterckx, Iskander Benhadj, Jan Biesemans, Wouter Dierckx, Jan Dries, Stefan Livens, Ils Reusen, Kris Nackaerts, Richard Kleihorst, Tanja Van Achteren—VITO NV, Remote Sensing and Earth Observation Processes

- ▶ **Instrumentation to Characterize the Moon as a Reference Standard for Space-based Radiometry**

Allan Smith, Raju Datla—NIST; Steven Lorentz—L-1 Standards and Technology; Tom Stone—US Geological Survey

- **Investigation of Several Materials, Including Spectralon, as a Potential 3.39-micron MWIR BRDF Standard**

Bradley Balling, Michael Marciniak—Air Force Institute of Technology

POSTER SESSION

- ▶ **IR Calibration Capabilities of the Missile Defense Transfer Radiometer (MDXR) and Applications to IR Test Chamber Calibrations**
Adriaan Carter, Raju Datla—NIST; Timothy Jung, Solomon Woods—Jung Research and Development
- ▶ **Measurement Astrophysics (MAP) First Steps: Precision Measurements of Atmospheric Extinction**
Peter Zimmer, John McGraw—University of New Mexico
- ▶ **New Method for Calibration of Sun Photometers for Atmospheric Remote Sensing**
H.H. Asadov, I.G. Chobanzadeh—Azerbaijan National Aerospace Agency
- ▶ **New NIST Capability for Infrared Spectral Characterization of High Temperature Sources up to 1000 °C**
Vladimir Khromchenko—USU/Space Dynamics Laboratory; Sergey Mekhontsev, Leonard Hanssen, Charles Gibson—NIST
- ▶ **On-orbit Solar Calibrations Using the Clouds and Earth's Radiant Energy System (CERES) In-flight Mirror Attenuator Mosaic (MAM) Calibration System**
Robert S. Wilson—SSAI
- ▶ **Radiometric Performance of the CERES Earth Radiation Budget Climate Data Record Edition-3 Products**
Kory Priestley—NASA Langley Research Center
- **Ray Trace Study of Hemispherical Reflectance Measurement for Large Cavities**
Jinan Zeng—USU/Space Dynamics Laboratory; Leonard Hanssen—NIST
- **Realization of Radiance Temperature Scale to Test the Blackbody Calibration Source for Calibration of Spaceborne Infrared Instruments**
Chul Woung Park, Yong-Shim Yoo, Bong-Hak Kim, Dong-Hoon Lee, Seung-Nam Park—Korea Research Institute of Standards and Science/Center for Temperature & Light
- **Realization of Spectral Irradiance Scale of KRISS to Calibrate Standard Source for Spectroradiometers by Using High Temperature Blackbody**
Dong-Joo Shin, Dong-Hoon Lee, Chul-Woung Park, Yong-Wan Kim, Seung-Nam Park—Korea Research Institute of Standards and Science
- **Stability Characterization of UV and Blue High-Flux Light Emitting Diodes as In-Flight Radiometric Sources**
Mark Helmlinger, Butch Miller, James Barter, Mark Frink—Northrop Grumman Aerospace Systems
- ▶ **Using the Antarctic Dome C Site for Climate Quality Calibration**
Ping Jing—IMSG at NOAA/NESDIS/STAR; Changyong Cao—NOAA/NESDIS/STAR
- ▶ **Utilization of Linear Programming for Optimization of Multi-Wavelength Photometers**
H.H. Asadov, D.Z. Aliyev—Azerbaijan National Aerospace Agency
- **WISE Non-Linearity Characterization**
Harri Latvakoski, Joel Cardon, Mark Larsen—USU/Space Dynamics Laboratory

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- Beef Fajita Wrap
- Buffalo Chicken Wrap
- Greek Supreme Wrap
- Potato salad
- Fruit tray
- Potato chips
- Dessert

WEDNESDAY'S BARBEQUE

- Barbequed chicken and pork
- Quinoa (vegetarian)
- Baked beans (vegetarian)
- Dutch oven potatoes (vegetarian available)
- Mixed green salad with ranch dressing or vinaigrette
- Homemade rolls
- Cobbler

WEDNESDAY'S LUNCHEON

- Italian Sausage
- Vegetarian Lasagna
- Linguine or spaghetti noodles with steamed vegetables and light sauce
- Salad w/choice of Italian or Balsamic Vinaigrette
- Roasted garlic bread
- Italian Ice

THURSDAY'S LUNCHEON

- Build Your Own Taco Bar
- Shredded chicken and Shredded beef
- Selection of toppings
- Mexican rice
- Refried beans
- Tortilla chips and salsa
- Tres Leches

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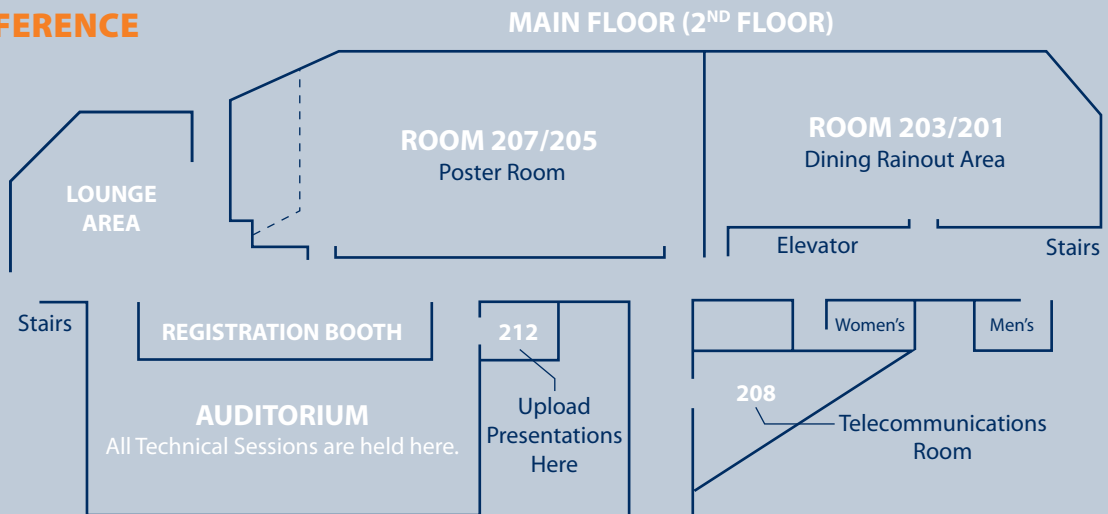
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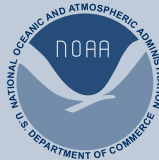
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