



**2019 Space Weather Workshop**  
**Embassy Suites Hotel**  
**Boulder, Colorado**

**Monday, April 1 – Pre-Workshop Meetings**

- 1:30 – 4:30**     **UN International Civil Aviation Organization (ICAO) Discussion – Open** - Brent Gordon/Bill Murtagh – Pearl Street Ballroom
- 3:00 - 4:30**     **Student Networking Session – by invitation** – Carina Alden – Foothills Meeting Room
- 5:00 - 7:00**     **Networking Session for Space Weather Workshop Participants, Sponsored by Southwest Research Institute** – NCAR Mesa Lab – Busses provided from/to hotel

**Tuesday, April 2**

- 8:30**             **Workshop Opening Remarks**  
Bill Murtagh, NOAA/SWPC
- 8:45 – 9:00**     **Special Presentation: Update from the Executive Office of the President**  
Aaron Miles, Office of Science and Technology Policy
- 9:00 – 9:45**     **Operational Space Weather Services – Latest Developments**  
Chair: Bill Murtagh, NOAA/SWPC
- 9:00**             **SWPC Update to the 2019 SWW**  
Brent Gordon, NOAA/SWPC
- 9:15**             **Current Mission and Future plans for the USAF Space Weather Operations Center**  
Major Eric Cercone, US Air Force/557<sup>th</sup> Weather Wing
- 9:30**             **Space Weather Enterprise - ACSWA**  
Conrad Lautenbacher, American Commercial Space Weather Association
- 9:45 – 10:45**    **Break and Poster Session (Solar and Interplanetary Research and Applications)**
- 10:45 - 12:15**   **Panel Session: Space Weather and ICAO: Meeting Needs for Global Aviation Services**  
Chair: Brent Gordon, NOAA/SWPC
- 10:45**           **Regulatory Group/Policy Perspective**  
Bill Bauman, Federal Aviation Administration
- 11:00**           **Space Weather: An Airline Perspective**  
Mike Stills, United Airlines

- 11:10**     **A Practitioner's Perspective on Integrating ICAO Requirements into Operations**  
Rob Steenburgh, NOAA/SWPC
- 11:20**     **PECASUS, a European Space Weather Service Network for Aviation**  
Ari-Matti Harri, Finnish Meteorological Institute
- 11:30**     **Service Center – Australia-Canada-France Japan Consortium**  
David Boteler, Natural Resources Canada
- 11:40**     **Commercial Sector Space Weather Support for ICAO**  
W. Kent Tobiska, Space Environment Technologies, LLC
- 11:50-12:15**     **Panel/Audience Discussion**
- 12:15 – 1:45**     **Lunch & SWPC Tour**
- 1:45 – 2:00**     **Keynote: Satellite Anomalies and the Radiation Belts**  
Daniel Baker, University of Colorado Boulder
- 2:00 - 3:15**     **Satellite Impacts and Anomaly Support**  
Chair: Janet Green, Space Hazards Applications
- 2:00**     **The Wave of Sensitive Systems**  
Jonny Dyer, Lyft
- 2:15**     **A 60-satellite Space Weather Constellation with Real-time 24/7 Globalstar Coverage**  
Hank Voss, Nearspace Launch, Inc.
- 2:30**     **SpaceWx and UK SKYNET Operations and Exercises**  
Ewan Haggerty, Airbus Defense and Space
- 2:45**     **Spwx Correlations to Abnormal Satellite State of Health**  
Chris Bowman, Data Fusion and Neural Networks
- 3:00**     **Roadmaps from the Space Environment Engineering and Science Applications Workshop**  
Paul O'Brien, The Aerospace Corporation
- 3:15 - 4:15**     **Break and Poster Session (Solar and Interplanetary Research and Applications)**
- 4:15 - 5:30**     **Space Weather Support for the Arctic Region**  
Chair: Rodney Viereck, NOAA/SWPC
- 4:15**     **Arctic Marine Navigation and Communication Support**  
Captain David Zezula, NOAA
- 4:30**     **Arctic Research at the Geophysical Institute**  
Bob McCoy, University of Alaska Geophysical Institute
- 4:45**     **Analytic and Experimentation Capabilities for Arctic Communications and Operations**  
Jennifer Forsyth, The MITRE Corporation
- 5:00**     **Space Weather in the NWS Alaska Region**  
David Kochevar, NOAA/NWS Alaska Region

**5:15 - 7:00**     **Networking Reception to Welcome Our International Attendees, Sponsored by Secure World Foundation and Colorado Office of Economic Development and International Trade (OEDIT) – open to all workshop participants**

**5:45 - 8:00**     **13<sup>th</sup> Annual NOAA - Commercial Space Weather Interest Group (CSWIG)/American Commercial Space Weather Association (ACSWA) Summit Meeting – by invitation**

**Wednesday, April 3**

**8:30 - 8:45**     **Keynote: Overview of NASA's Exploration Campaign**  
Steve Clarke, National Aeronautics and Space Administration

**8:45 – 10:00**     **Panel Session: Space Weather Support for Human Expansion Across the Universe**  
Chair: Linda Parker, Universities Space Research Association

**8:45**             **Operational Space Weather Forecasting Needs for Manned Exo-LEO Missions**  
Eddie Semones, NASA Johnson Space Center

**8:55**             **Air Force Research Laboratory's Solar Energetic Particle Forecasting Needs**  
Rachel Hock-Mysliwicz, Air Force Research Laboratory

**9:05**             **ESA Space Weather Activities in Space Safety Programme**  
Juha-Pekka Luntama, European Space Agency

**9:15**             **Solar Energetic Particle Forecasting: Current Capabilities and Future Directions**  
Hazel Bain, NOAA/SWPC

**9:25**             **Active Dosimeter-Based Estimate of Astronaut Acute Radiation Risk from Solar Energetic Protons**  
Chris Mertens, National Aeronautics and Space Administration at Langley

**9:35-10:00**     **Panel/Audience Discussion**

**10:00 - 11:00**   **Break and Poster Session (Ionosphere and Thermosphere Research and Applications and General Space Weather Services)**

**11:00 - 12:00**   **Agency Vision on Implementation of Space Weather R2O2R**  
Chair: Tamara Dickinson, Science Matters Consulting

**11:00**             **Vision on Implementation of Space Weather R2O2R – NOAA Perspective**  
Mary Erickson, Deputy Director of the National Weather Service

**11:15**             **Heliophysics at NASA and the Science of Space Weather**  
Jim Spann, National Aeronautics and Space Administration

**11:30**             **NSF Space Weather Activities**  
Michael Wiltberger, National Science Foundation

**11:45**             **USAF Space Weather O2R2O Efforts**  
Michael Farrar, US Air Force Directorate of Weather

**12:00**             **UK R2O Activities**  
Mark Gibbs, United Kingdom Met Office

- 12:15 – 2:00 Graduate Student & Early Career Advisory Panel – Students/by invitation**
- 12:15 - 1:35 Lunch**
- 1:35 - 2:50 [Extreme Space Weather Benchmarks](#)**  
Chair: Geoffrey Reeves, Los Alamos National Laboratory
- 1:35 [Benchmarks for Induced Geo-Electric Fields](#)**  
Pete Riley, Predictive Science Inc.
- 1:50 [Space Weather Impacts of Solar Radio Bursts](#)**  
Dale Gary, New Jersey Institute of Technology
- 2:05 [Next Steps in Determining Space Weather Benchmarks for Ionizing Radiation Hazards](#)**  
Christina Cohen, California Institute of Technology
- 2:20 [National Benchmarks for Ionospheric Disturbances](#)**  
Susan Skone, University of Calgary
- 2:35 [Upper Atmosphere Expansion](#)**  
Eric Sutton, University of Colorado Boulder
- 2:50 - 3:45 [Break and Poster Session \(Ionosphere and Thermosphere Research and Applications and General Space Weather Services\)](#)**
- 3:45 – 4:00 [Modernizing the Power Grids and Understanding Potential Impacts from Solar Weather](#)**  
Ben Kroposki, National Renewable Energy Laboratory
- 4:00 – 5:15 [Panel Session: Space Weather Services for the Electric Power Grid](#)**  
Chair: Seth Jonas, Science and Technology Policy Institute
- 4:00 [Integrating Space Weather and Ground-based Magnetotelluric Data with Powerflow Solutions for Real-time Assessment of Risk to the Power Grid](#)**  
Adam Schultz, Oregon State University
- 4:15 [NOAA’s Development of Regional Geoelectric Field Modeling Capability: New Nowcast and Forecast Products to Improve Operational Decision Making of the U.S. Electrical Power Grid in Response to Geomagnetic Storms](#)**  
Christopher Balch, NOAA/SWPC
- 4:30 [Magnetic-storm Geoelectric Hazard Maps and the Induction of Voltages on Power-grids](#)**  
Jeffrey Love, US Geological Survey
- 4:45 [Using MT Data to Improve Regional Ground Response Models](#)**  
Jennifer Gannon, CPI Computational Physics, Inc.
- 5:00-5:15 Panel/Audience Discussion**
- 6:30 - 9:00 Banquet Dinner at Pearl Street Ballroom, Sponsored by Lockheed Martin and Southwest Research Institute**  
**Special Guest Speaker: Nicola Fox, Heliophysics Division Director, NASA**

**Thursday, April 4**

- 8:30 - 10:00**    **International Coordination on Space Weather Research**  
Chris Cannizarro, US Department of State
- 8:30**            **International Coordination**  
Jean-Luc Bald, European Commission Delegation to the US
- 8:45**            **Ensemble Flare Forecasting: Using Terrestrial Weather Prediction Techniques to Improve Space Weather Operations**  
Sophie Murray, Trinity College of Dublin
- 9:00**            **UN COPUOS – Long Term Sustainability Guidelines**  
Peter Martinez, Secure World Foundation
- 9:15**            **Space Weather Initiatives in Latin America**  
Joaquim E.R. Costa, National Institute for Space Research
- 9:30**            **Modelling GICs in Australian Power and Pipeline Networks**  
Jeanne Young, Australia Bureau of Meteorology
- 9:45**            **ESA Space Weather Activities in Space Safety Programme**  
Juha-Pekka Luntama
- 10:00 - 11:00**   **Break and Poster Session (Geospace/Magnetosphere Research and Applications)**
- 11:00 - 12:00**   **Advances in Ground and Space-based Observations**  
Chair: Douglas Biesecker, NOAA/SWPC
- 11:00**            **Innovative Partnerships: NOAA's Commercial Weather Data Pilot**  
Timothy Duly, Spire Global, Inc.  
Conrad Lautenbacher Jr., GeoOptics, Inc.  
Rob Kursinski, PlanetIQ
- 11:15**            **Polarized Imaging for CME Tracking and 3D Structure**  
Craig Deforest, Southwest Research Institute
- 11:30**            **NOAA's Current and Future Space Weather Architecture**  
Elsayed Talaat, NOAA/NESDIS
- 11:45**            **Space Weather Monitoring with the NOAA GOES-R Series Spacecraft: Instruments, Observations and Products**  
Rob Redmon, NOAA/NCEI
- 12:00 - 2:00**    **Lunch & SWPC Tour**
- 2:00 – 2:15**     **Keynote: Some First Results from the FIELDS Instrument Suite on Parker Solar Probe**  
Stuart Bale, University of California, Berkeley
- 2:15 - 3:30**     **Research – Advances in Ground and Space-based Observations**  
Chair: Tim Fuller-Rowell, University of Colorado Boulder
- 2:15**            **New Observations from NASA's Global-scale Observations of the Limb and Disk (GOLD) Mission**  
Richard Eastes, University of Colorado Boulder

- 2:30**      **Space Weather Measurements from MACAWS: Monitors for Alaskan and Canadian Auroral Weather in Space (MACAWS)**  
Anthea Coster, Massachusetts Institute of Technology
- 2:45**      **GTOSat: A Pathfinder for a SmallSat-based Operational Space Weather Program**  
Larry Kepko, National Aeronautics and Space Administration
- 3:00**      **GOES-R Solar UltraViolet Imager Extended Coronal Imaging**  
Sivakumara Tadikonda, NOAA/NESDIS
- 3:15**      **Seismic Monitoring of the Sun's Far Hemisphere**  
Joe Werne, NorthWest Research Associates
- 3:30 - 4:30**      **Break and Poster Session (Geospace/Magnetosphere Research and Applications)**
- 4:30 - 5:40**      **Advances in Space Weather Research and Modeling**  
Chair: Michele Cash, NOAA/SWPC
- 4:30**      **Research and Modeling at the Air Force Research Laboratory**  
James McCollough, Air Force Research Laboratory
- 4:45**      **CCMC-SWPC Partnership Aiming to Improve Operational Space Weather Products and Services**  
Maria Kuznetsova, National Aeronautics and Space Administration
- 5:00**      **Machine Learning in Space Weather**  
Enrico Camporeale, NOAA/SWPC
- 5:10**      **The Performance Characteristics of Operational Flare Forecasting Systems**  
KD Leka, NorthWest Research Associates
- 5:20**      **NASA's SPoRT Center: Progress in Extending Terrestrial Weather R2O/O2R to Space Weather**  
Ghee Fry, National Aeronautics and Space Administration
- 5:30**      **Applied Artificial Intelligence for Science and Exploration**  
Madhulika Guhathakurta, National Aeronautics and Space Administration

**Friday, April 5**

- 8:30 – 10:00**      **Advances in Space Weather Research and Modeling: Solar Wind and CMEs**  
Chair: James Spann, National Aeronautics and Space Administration
- 8:30**      **Space Weather Science and Applications O2R Investigations**  
James Spann, National Aeronautics and Space Administration
- 8:35**      **Global Boundary Magnetic Field Optimization for Coronal and Solar Wind Models**  
Graham Barnes, NorthWest Research Associates
- 8:41**      **Improving Magnetic Field Boundary Conditions for Solar Wind Models**  
Thomas Berger, University of Colorado Boulder
- 8:47**      **A Higher-Accuracy Model of the Heliosphere with Improved Background Solar Wind and Coronal Mass Ejections**  
Tae Kim, University of Alabama, Huntsville

- 8:53**      **Using Machine Learning to Validate Heliophysical Models**  
Michael Kirk, Catholic University of America
- 8:59**      **Inner Heliosphere Modeling With the GAMERA MHD Model**  
Sasha Ukhorskiy, Johns Hopkins University
- 9:05**      **Improving the Prediction Accuracy of CME Arrivals in the WSA-ENLIL-Cone Model**  
Dusan Odstrcil, George Mason University
- 9:11**      **Using Magnetograms and Coronal Imaging to Improve Solar Wind Predictions**  
Yi-Ming Wang, Naval Research Laboratory
- 9:17**      **Reliably Inferring the Sun's Far-Side Magnetic Flux for Operations Using Time-Distance Helioseismic Imaging**  
Shea Hess Webber, Stanford University
- 9:23**      **Metric-Based Assessment of New Solar Wind Forecast Models Incorporating Data Assimilation**  
Pete Riley, Predictive Sciences, Inc.
- 9:29**      **Space Weather O2R: Physics-Based Extension of the WSA Model Capabilities**  
Igor Sokolov, University of Michigan
- 9:35**      **Interactive Tool for Modeling Multiple Solar Eruptions**  
Jon Linker, Predictive Sciences, Inc.
- 9:41 – 10:00**      **Discussion**
- 10:00 - 10:30**      **Break**
- 10:30 – 11:45**      **Advances in Space Weather Research and Modeling: Magnetospheric Energetic Particles and Plasma**  
Chair: Howard Singer, NOAA/SWPC
- 10:30**      **Quantitative Forecasts and Specifications of Outer Radiation Belt Electrons Based on Solar Wind Conditions**  
Xinlin Li, University of Colorado Boulder
- 10:36**      **Specifying High-altitude Electrons Using Low-altitude LEO Systems (SHELLS)**  
Janet Green, Space Hazards Applications, LLC
- 10:42**      **PreMevE: A Neural Network Based Predictive Model for MeV Electrons inside Earth's Outer Radiation Belt**  
Yue Chen, Los Alamos National Security, LLC
- 10:48**      **A Machine Learning Based Specification and Forecast Model of the Inner Magnetospheric Radiation Environment**  
Jacob Bortnik, University of California Los Angeles
- 10:54**      **An ARIMAX Model of ULF Wave Power and Radial Diffusion for Space Weather Forecasting**  
Kyle Murphy, University of Maryland, College Park
- 11:00**      **Data-Augmented Forecasting Model for near-Earth Relativistic Electron Intensities**  
Sasha Ukhorskiy, Johns Hopkins University

**11:06**      **Advanced Particle and Plasma Environment Specification Model for Spacecraft Impacts**  
Mei-Ching Fok, National Aeronautics and Space Administration

**11:12**      **Development of a Predictive Inner Magnetosphere Model for Space Weather**  
Stanislav Sazykin, William Marsh Rice University

**11:18**      **ARMAS Dual Monitor: Demonstrating an Operational Aviation Radiation Monitoring System**  
W. Kent Tobiska, Space Environment Technologies, LLC

**11:24 – 11:45**      **Discussion**

**11:45 – 12:00**      **Solar Cycle 25 Predictions**  
Lisa Upton, High Altitude Observatory

**12:00**      **Workshop Closing Remarks**  
Howard Singer, NOAA/SWPC