



2022 Space Weather Workshop (virtual meeting)

THEME: Collaboration: Advancing the Space Weather Enterprise

Times in EDT

Monday Evening, April 25 (Session for Students)

6:00 – 8:00 pm **Space Weather: Student Welcome and Citizen Science Discussion**
Sophie Graf (Organizer, UT, Arlington); co-chair Elizabeth Vandegrif (UT, Arlington)

6:00 **Space Weather Workshop Student Welcome**
Sophie Graf, UT Arlington

6:05 **Introduction to the Space Weather Workshop and Overview for Students**
Bill Murtagh, NOAA/SWPC

6:20 – 6:35 **Q&A**

6:35 **Introduction to the Space Weather Student Career Development Resource**
Sophie Graf, UT, Arlington

6:50 – 7:00 **Q&A**

7:00 **Heliophysics Citizen Science and Innovation in the Past, Present, and Future**
Liz MacDonald, NASA Goddard Space Flight Center

7:20 **HamSCI: Collaborating with Radio Amateurs to Better Understand Space Weather**
Nathaniel Frissell, University of Scranton

7:40 – 8:00 **Q&A**

Tuesday, April 26

10:00 **Opening Remarks and Welcome**
Bill Murtagh, National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), Space Weather Prediction Center (SWPC)

- 10:05 – 10:50** **Space Weather Policy**
Co-Chairs: Bill Murtagh, NOAA/SWPC
 Jinni Meehan, NOAA/NWS Headquarters
- 10:05** **Space Weather and Critical Infrastructure Resilience: Senior Officials Exercise**
Caitlin Durkovich, Resilience and Response, National Security Council (NSC), White House
- 10:15** **Update from the Office of Science and Technology Policy (OSTP)**
Ezinne Uzo-Okoro, Executive Office of the President (EOP) /Office of Science and Technology Policy (OSTP)
- 10:25** **Implementation of U.S. Space Weather Policy**
Mary Erickson, Space Weather Operations, Research and Mitigation Subcommittee (SWORM)/ National Weather Service
- 10:35** **UK Space Weather Strategy and US - UK Workshop**
Mark Prouse, Department for Business, Energy & Industrial Strategy, UK
- 10:45 - 10:50** **Break**
- 10:50 – 11:19** **Implementing the “Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow” Act - Part I**
Co-Chairs: Jinni Meehan, NOAA/NWS
 Bill Murtagh, NOAA/NWS/SWPC
- 10:50** **NOAA National Weather Service (NWS)**
Clinton Wallace, NOAA/NWS/SWPC
- 10:58** **Implementing the PROSWIFT ACT**
Lt Col Justin Erwin, DOD/USAF
- 11:06** **Space Weather Advisory Group (SWAG)**
Tammy Dickinson, Science Matters Consulting
- 11:14 – 11:19** **Break**
- 11:19 – 12:15** **Implementing the “Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow” Act – Part II**
Co-Chairs: Jinni Meehan, NOAA/NWS
 Bill Murtagh, NOAA/NWS/SWPC
- 11:19** **NOAA National Environmental Satellite, Data, and Information Service (NESDIS)**
Elsayed Talaat, NOAA/NESDIS/Office of Projects, Planning and Analysis (OPPA)
- 11:27** **NASA**
Jamie Favors, NASA Headquarters, Heliophysics Division
- 11:35** **NSF**
Mangala Sharma, NSF Geospace Section
- 11:43** **American Commercial Space Weather Association (ACSWA)**
Kent Tobiska, Space Environment Technologies
- 11:51 – 12:15** **Community Discussion with Morning Session Speakers**
- 12:15 – 1:00** **Lunch and
National Academies of Sciences Space Weather Roundtable Discussion (12:20-12:55)**

Co-Chairs: Bill Murtagh, NOAA SWPC

Jinni Meehan, NOAA/NWS

Art Charo, National Academy of Sciences

1:00 – 2:30

Space Traffic Coordination and Space Situational Awareness

Co-Chairs: Janet Green, Space Hazards Applications

Mike Bonadonna, NOAA NESDIS

1:00

Session Introduction – Janet Green

1:05

Still Muddling Through Space Traffic Management

Brian Weeden, Secure World Foundation

1:15

Office of Space Commerce – New Operational SSA System

Brian Bates, NOAA Office of Space Commerce

1:25

Space Domain Awareness Environmental Toolkit for Defense: Software Transition Approach

Sage Andorka, United States Space Force (USSF)

1:35

LEO Space Environment Impacts on Satellite Orbits

Eric Sutton, Univ. of Colorado, Technology, Research and Education Center (TREC)

1:45

Space Weather Environment during SpaceX Starlink Satellite Loss in February 2022

Tzu-Wei Fang, NOAA SWPC

1:55

Space Weather Tools for Investigating Satellite Anomalies: Current Status and Future Needs

Alex Boyd, Aerospace Corporation

2:05

Q&A

2:30 – 3:00

Break

3:00 – 4:30

Space Weather Support for Human Exploration

Co-Chairs: Azita Valinia, NASA Engineering & Safety Center (NESC)

Terry Onsager, NOAA SWPC

3:00

Session Introduction – Azita Valinia

3:05

Space Weather and Crew Health Implementations

John Allen, NASA Headquarters, Human Exploration and Operations

3:15

Space Radiation and Analysis Group

Janet Barzilla, NASA Johnson Space Center (JSC)

3:25

NASA Moon to Mars (M2M) Activities

Yaireska Collado-Vega, NASA Goddard Space Flight Center

3:35

Radiation Monitoring and Shielding Capability Gaps

Joe Minow, NASA Engineering & Safety Center

3:45

Forecasting Solar Particle Events in Support of Human Space Exploration

Hazel Bain, University of Colorado Cooperative Institute for Research in Environmental Sciences (CIRES)/NOAA SWPC

3:55

Solar Cycle Prediction Capabilities for Timing of Mars Missions

Ron Turner, Analytical Services, Inc. (ANSER)

4:05 – 4:30 Q&A

4:30 – 5:00 Break

5:00 – 6:30 **Lightning Talks (5:00-5:30) and Poster Session (5:30-6:30):
Solar and Interplanetary Research and Applications**

Chair: Eric Adamson/NOAA SWPC

Lightning Talk Presenters (3 min each, from 5:00-5:30 EDT; poster viewing from 5:30-6:30 EDT)

Predicting Solar Proton Events of Solar Cycles 22-24

Aatiya Ali, Georgia State University

Simplified CME Monitoring and Characterization by Summarizing Time Series of Coronagraph Images

Manuel Flores-Soriano, University of Alcalá, Space Weather Group

Coronal Hole Observer and Regional Tracker for Long-term Examination

Chris Lowder, Southwest Research Institute

Improving Operational Solar EUV Irradiance Modeling Using Physics-Based Differential Emission Measure Techniques

Courtney Peck, CIRES/University of Colorado, NOAA NCEI

Mapping the Sun with the Italian Radio Telescopes

Simona Righini, Istituto Nazionale di Astrofisica

What Machine Learning Algorithms Teach Us about Which Explanatory Variables Matter Most in Predicting Bz within Coronal Mass Ejections

Pete Riley, Predictive Science Inc.

Concept for Real-Time Solar Flare Predictions

Juliana Vievering, Johns Hopkins University Applied Physics Laboratory

Wednesday, April 27

10:00 – 11:30 **Space Weather: Meeting the Needs of the Energy Sector**

Co-Chairs: Josh Rigler, US Geological Survey (USGS)

Jenn Gannon, Computational Physics, Inc.

10:00 **Session Introduction – Josh Rigler, USGS**

10:05 **Lessons learned from Historical Geomagnetic Storms**
Jeff Love, USGS

10:15 **Xcel Energy MagSTAR Magnetometer Project**
Matt Twardy, Xcel Energy

10:25 **Understanding the interconnections of the Sun-to-Power Grid System: Convergence and the NSF Workshop on simulating Space Weather Extremes**
Ryan McGranaghan, Orion Space Solutions

10:35 **Modelling and Validation of Geomagnetically Induced Currents and The Impact on the Swedish Power Grid**
Lisa Rosenqvist, Swedish Defence Research Agency, FOI, Sweden

10:45 **Use of NERC-collected Geomagnetically Induced Currents (GIC)-related data**
Mark Olson, North American Electric Reliability Corporation (NERC)

10:55 **Geomagnetically Induced Currents (GIC) Model Validation**
Bob Arritt, Electric Power Research Institute (EPRI)

11:05 – 11:30 Q&A

11:30 – 1:00 **Lunch and following events:**

- **Student Lunch: Student Government and Private Sector Career Path Panel (11:40-12:50)**

Chair: Sophie Graf, UT, Arlington; co-chair Elizabeth Vandegrif (UT, Arlington)

Panelists:

Janet Green, Space Hazards Applications
 Jinni Meehan, NOAA/NWS Headquarters
 Alex Boyd, Aerospace Corporation
 Mangala Sharma, NSF Geospace Section

- **16th Annual NOAA - American Commercial Space Weather Association (ACSWA) Summit Meeting – by invitation (11:40-12:50)**

1:00 – 2:30

Space Weather: Meeting the Needs for Global Aviation Services

Co-Chairs: Brent Gordon, NOAA SWPC
 Robyn Fiori, Natural Resources Canada (NRCan)

1:00

Session Introduction – Brent Gordon, NOAA SWPC

1:05

Communication, Navigation, and Irradiation – ICAO Space Weather Services for Aviation
 Rob Steenburgh, SWPC

1:15

Space Weather Considerations for Airlines
 Stephanie Klipfel, Manager Meteorology and A4A Meteorology Committee Chair Delta Air Lines

1:25

UK User Feedback on Space Weather Products
 Krista Hammond, UK Met Office (UKMO)

1:35

Operational Monitoring of Cosmic Radiation for Civil Aviation with the SiGLE-RT Model
 Philippe Yaya, CLS (France)

1:45

Progress Towards Resolving Maximum Usable Frequency (MUF)
 Loredana Perrone, INGV (Italy)

1:55

Space Weather and Aviation Testbed Experiment and Exercise
 Michele Cash, NOAA SWPC

2:05 – 2:30

Q&A

2:30 – 3:00

Break

3:00 – 4:30

Observing and Modeling the Ionosphere: Supporting Communications and Navigation

Co-Chairs: Tim Fuller-Rowell, CU CIRES/NOAA SWPC
 Holly Gilbert, NCAR High Altitude Observatory (HAO)

3:00

Session Introduction – Tim Fuller-Rowell, CU CIRES/NOAA SWPC

3:02

Observing and Modeling the Ionosphere: Supporting Communications and Navigation
 Sean Elvidge, University of Birmingham, UK

3:12

Supporting Space Weather with the Geospace Dynamics Constellation
 Katherine Garcia-Sage, NASA Goddard Space Flight Center

3:22

Forecasting Equatorial Ionospheric Stability Using a Regional Model and WAM-IPE
 David Hysell, Cornell University

- 3:32 Q&A**
- 3:45 -4:30 Space Weather Workforce Development**
Co-Chairs: Mangala Sharma, NSF Geospace Section
Frank Centinello, NOAA Corps, SWPC
- 3:45 Session Introduction – Mangala Sharma, NSF Geospace Section**
- 3:47 – 3:52 Commercial Sector Space Weather Job Opportunities and Qualifications**
Laura Stiles, Blue Origin
- 3:52 – 3:57 My Future Career: How do I get there and what's next?**
M. Chantale Damas, Queensborough Community College
- 3:57 – 4:02 Ways That Space Weather Can Open Doors and How to Make Sure Those Doors Don't Hit You in the Back**
Joe Mazur, Aerospace Corp
- 4:02 – 4:07 Millersville University Space Weather Certificate Program**
Richard Clark, Millersville University
- 4:07 – 4:30 Q&A**
- 4:30 – 5:00 Break**
- 5:00 – 6:30 Lightning Talks (5:00-5:30) and Poster Session (5:30-6:30)**
Ionosphere and Thermosphere Research and Applications
Space Weather Policy and General Space Weather Contributions
Chair: Delores Knipp, CU Smead Aerospace Engineering Sciences
- Lightning Talk Presenters (3 min each, from 5:00-5:30 EDT; poster viewing from 5:30-6:30 EDT)
- Detection of High-Latitude Ionospheric Plasma Conditions Leading to GPS Scintillations Using a Novel Poker Flat Incoherent Scatter Radar Mode**
Jacob Willis, United States Military Academy
 - Innovative Global Ionospheric Total Electron Content (TEC) Map Reconstruction and Forecasting Using Machine Learning**
Shasha Zou, University of Michigan
 - PlanetiQ GNSS RO Measurements of the Ionosphere**
Rob Kursinski, PlanetiQ
 - Applications of FORMOSAT-7/COSMIC-2 to Space Weather at CWB/SWOO**
I-Te Lee, Center Weather Bureau
 - Performance of a Locally Adapted NeQuick-2 Model During 2014 Solar Maximum over the Brazilian Equatorial Region**
Osanyin Taiwo, National Institute for Space Research
 - A Machine-Learning Oriented Remote and In-Situ Dataset for Forecasting SEP Occurrence and Properties**
Kimberly Moreland, University of San Antonio/Southwest Research Institute
 - A New Interactive 3-Dimensional Data Viewer for the Enlil Solar Wind Model**
Christopher Pankratz, University of Colorado, Boulder
 - Osses and Other Numerical Studies in Support Of The Space Weather Next (SW Next) Program**
Dimitrios Vassiliadis, NOAA/NESDIS

Thursday, April 28

- 10:00 – 12:00 Space Weather Research to Operations to Research (R2O2R) Applications**

Co-Chairs: Barbara Giles, NASA Goddard Space Flight Center
Jim Spann, NASA Headquarters, Heliophysics Division

- 10:00** **Session Introduction** – Barbara Giles, NASA Goddard Space Flight Center
- 10:05** **Space-Weather CubeSat Array for 24/7 Prompt Global Coverage Experiment (SWAP-E)**
Henry Voss, NearSpace Launch, Inc.
- 10:14** **Operationalizing Data-driven Prediction Tools for Post-eruption Solar Energetic Particles**
Sumanth Rotti - Petrus Martens, Georgia State University
- 10:23** **Forecasting Solar Energetic Particle Events at the Cis-Lunar Environment using the Combined AWSOM-iPATH Model**
Gang Li, University of Alabama Huntsville
- 10:32** **Predicting the Bookend Solar Flares**
KD Leka, Northwest Research Associates (NWRA)
- 10:41** **Commercial R2O Testbed**
Alec Engell, NextGen Federal Systems
- 10:50** **Forecasting Solar Flares Using the Time Evolution of Active Regions and Machine Learning Techniques**
Talwinder Singh, University of Alabama, Huntsville
- 10:59** **Transitioning from Deterministic to Probabilistic Space Weather Forecast using Ensembles of Neural Networks**
Andrés Munoz-Jaramillo, Southwest Research Institute (SwRI)
- 11:08** **Forecasting Solar Energetic Particle Radiation Using Data-Driven and Physics-Based Simulations**
Lulu Zhao, University of Michigan
- 11:17** **Miniaturized Nightglow Interferometer for Monitoring Emissions from a CubeSat**
Wilbert Skinner, Michigan Aerospace Corporation
- 11:26** **Kamodo Space Weather Models**
Michael Contreras, Ensemble Government Services, LLC
- 11:35** **Space Weather Forecasting Toolset to Support Operations**
Robert Arslanbekov, CFD Research Corporation
- 11:44** **Session Wrap-up and Inspiration for Future R2O2R**
Janet Green, Space Hazards Applications
- 11:53** **Q&A**

12:00 - 1:00

**Lunch and
Heliophysics Decadal Survey Plans-Interactive Discussion (12:10-12:50)**

Co-Chairs: Howard Singer, NOAA SWPC
Frank Centinello, NOAA Corps/SWPC

Art Charo, National Academy of Sciences
Jared Leisner, NASA, Heliophysics Division
Elsayed Talaat, NOAA/NESDIS/Office of Projects, Planning and Analysis (OPPA)
Carrie Black, NSF, Division of Astronomical Sciences and

Lisa Winter, NSF Atmospheric and Geospace Sciences Division

1:00 - 2:30

Space Weather: New and Future Observations to Advance Understanding and Forecasting

Co-Chairs: Irfan Azeem, NOAA NESDIS
Simon Machin, UK Met Office

1:00

Session Introduction – Irfan Azeem, NOAA NESDIS

1:05

Strategies for Filling Critical Observational Gaps for Improved Space Weather Monitoring, Mitigation, and Predictive Capabilities

Drew Turner, Johns Hopkins University Applied Physics Laboratory (JHUAPL)

1:15

NOAA's Space Weather Follow On Program: Ensuring Continuity of Data for Geomagnetic Storm Forecasts

Doug Biesecker, NOAA NESDIS

1:25

Neutron Monitors and Space Weather—Back to the Future

James Ryan, University of New Hampshire (UNH)

1:35

Solar X-rays: Early Flare Signatures and How to Measure Them

Lindsay Glesener, University of Minnesota

1:45

Requirements for a Future Ground-based Solar Monitoring Network. Implications for ngGONG

Valentin Pillet, National Solar Observatory

1:55

Access Diverse Space Weather Data with SWx TREC's Space Weather Data Portal

Jenny Knuth, Univ. of Colorado, Technology, Research and Education Center (TREC)

2:05

Q&A

2:30 – 3:00

Break

3:00 – 4:30

Advances in Space Weather Modeling and Services

Co-Chairs: Dan Welling, University of Texas, Arlington, Physics Department
Howard Singer, NOAA/NWS/SWPC

3:00

Session Introduction – Dan Welling, University of Texas, Arlington, Physics Department

3:05

CCMC: Preparing Models to Enter the R2O Pipeline

Leila M. Mays, NASA Community Coordinated Modeling Center (CCMC)

3:15

Advancing Space Weather Predictions with Data Driven Methods -- Stories from SOLSTICE

Yang Chen, University of Michigan

3:25

PAGER: Probabilistic Sun to Earth Modeling Utilizing Data Assimilation and Machine Learning

Yuri Shprits, University of Potsdam

3:35

Space Weather Science and Forecasting at University of Texas at Arlington

Elizabeth Vandegrif, University of Texas Arlington

3:45

OSPRES: A Coupled Approach to Modeling CME-Driven Space Weather with Automatically-Generated User-Friendly Outputs

Christina Kay, Catholic University of America

3:55 **Aurora: Prediction, Imaging and Services**
Rodney Viereck, University of Colorado CIRES/NOAA SWPC

4:05 **Q&A**

4:20 **Workshop 'Penultimate' Remarks**
Howard Singer, NOAA/NWS/SWPC

4:30 – 5:00 **Break**

5:00 – 6:30 **Lightning Talks (5:00-5:30) and Poster Session (5:30-6:30):
Geospace/Magnetosphere and Aviation Radiation Research and
Applications**

Chair: Mary Hudson, Dartmouth College

Lightning Talk Presenters (3 min each, from 5:00-5:30 EDT; poster viewing from 5:30-6:30 EDT)

Fine Structure of Geoeffective Solar Wind Transients Complicating Space Weather Predictions

Matti Ala-Lahti, Department of Climate and Space Sciences and Engineering, University of Michigan

Geomagnetically Induced Current Measurements and Space Weather Prediction in Austria

Dennis Albert, Institute of Electrical Power Systems, Graz University of Technology

Association between the Spatial Characteristics of Relativistic Electron Precipitation Observed at LEO and its Magnetospheric Drivers

Luisa Capannolo, Boston University

Effects of Upstream Small Scale Structure on Predictive Performance of the Space Weather Modeling Framework

Sophie Graf, University of Texas at Arlington

MAGICIAN Project: Machine Learning, Data Collection, Education and Outreach for Space Science Research

Dogacan Ozturk, University of Alaska Fairbanks

An ML Approach to Forecasting Space Weather Impacts on Critical Infrastructure from Ground-Based Arrays

Adam Schultz, Oregon State University

Multiscale Atmosphere Geospace Environment Model

Michael Wiltberger, NCAR/HAO

Atmospheric Ionizing Radiation Environment (AIRE) Institute

Eric Benton, Oklahoma State University, Department of Physics