OFCM
OFFICE OF THE FEDERAL COORDINATOR
FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH
1325 EAST WEST HIGHWAY, SSMC2, SUITE 7130
SILVER SPRING, MARYLAND 20910

October 20, 2015

Dear Colleagues,

Welcome to the 2015 Space Weather Enterprise Forum! The members of the National Space Weather Program (NSWP) are pleased to present a wide-ranging and informative slate of speakers to address this year's theme: Implementing National Space Weather Strategy and Capabilities. Our distinguished speakers are national leaders and stakeholders from across government, industry, and academia, representing the array of activities from setting policy to guiding research to providing operational support for both civilian and national defense applications.

Our objectives in organizing this year's forum are:

- to share information across the enterprise and raise awareness for new users, decision makers, and policymakers
- to identify effective approaches to raise awareness and build resilience in the broader society, particularly in the area of critical infrastructure support
- to improve communications within and external to the enterprise.

In the past year, the members of the NSWP served on the Space Weather Operations, Research, and Mitigation (SWORM) Task Force chartered by the White House Office of Science and Technology Policy to develop a National Space Weather Strategy and Action Plan. The National Space Weather Strategy will articulate high-level strategic goals for enhancing our Nation's preparedness for a severe space weather event. SWORM Task Force members will share details of the National Strategy and provide an opportunity for comment from forum attendees during their panel discussion.

I want to express my sincere appreciation to Senator Bill Nelson for sponsoring the SWEF this year and Dr. William Leith from the United States Geological Survey for serving as our host. I would also like to thank the members of the NSWP and the SWEF Organizing Committee for helping to plan the forum. It is with the NSWP direction that the Office of the Federal Coordinator for Meteorology organized and is hosting the forum today.

Thank you for attending and contributing to the exchange of ideas, sharing of information, raising awareness of space weather and its effects, and for helping to build an informed and resilient society for the decade ahead. Please join in the discussions and enjoy the forum!

Sincerely,

Colonel Paul Roelle

Federal Coordinator for Meteorology (Acting)

2015 Space Weather Enterprise Forum

Implementing National Space Weather Strategy and Capabilities

Sponsored by Senator Bill Nelson

and

The National Space Weather Program

October 20, 2015: Hart Senate Office Building

Room SH-902

Second and C streets NE, Washington, DC 20510

AND

October 21, 2015: Herbert C. Hoover Building

Commerce Auditorium

1401 Constitution Avenue, NW, Washington, DC 20230

Welcome to the 2015 Space Weather Enterprise Forum (SWEF), hosted by **Senator Bill Nelson** and the **National Space Weather Program**. The SWEF brings together a blended audience of space weather experts from both research and operations, space weather users from the public and private sectors, academia, international representatives, and policymakers.

Reducing the Nation's vulnerability to space weather is a national priority. Space weather is a naturally occurring phenomenon that has the potential to negatively affect energy infrastructure, technology, and human health, which are essential contributors to national security and economic vitality. The term "space weather" refers to the dynamic conditions of the space environment that arise from interactions with emissions from the Sun, including solar flares, solar energetic particles, and coronal mass ejections (CME). Given the growing importance of reliable electric power and space-based assets for security and economic well-being, it is critical that we establish a strategy to improve the Nation's ability to protect, mitigate, respond to, and recover from the potentially devastating effects of space weather events.

In November 2014, as Chair of the National Science and Technology Council (NSTC), and on behalf of the President of the United States, Dr. John Holdren chartered the interagency Space Weather Operations, Research, and Mitigation (SWORM) Task Force. The Task Force is developing a National Space Weather Strategy that will articulate high-level strategic goals for enhancing our Nation's preparedness for a severe space weather event. SWORM Task Force

members will share details of the National Strategy and provide an opportunity for input from SWEF attendees during the panel discussion.

Forum Objectives

- Share information across the enterprise and raise awareness for new users, decision makers, and policymakers; areas of exchange include the following:
    - New research results
    - New transitions of research into operations
    - New products and services
    - National space weather operational capabilities
    - International activities and cooperation
    - Commercial space weather users and providers
- Identify effective approaches to build resilience across society, particularly in critical infrastructure protection and support.
- Identify effective approaches to raise awareness in the broader society.
- Improve communications within and external to the enterprise.
- Collect information to support the development of new National Space Weather Plans.

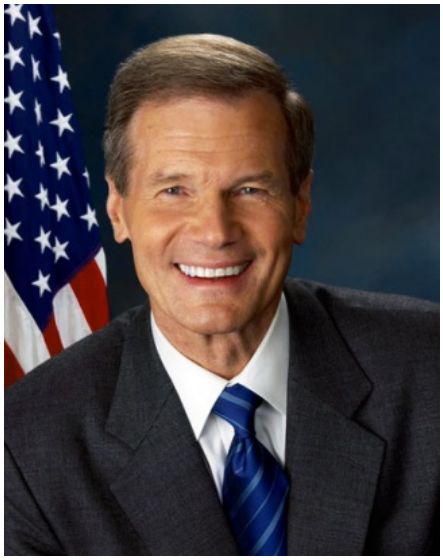
Sponsor

The 2015 Space Weather Enterprise is sponsored by Senator Bill Nelson and the National Space Weather Program (NSWP). The NSWP is part of the U.S. Federal meteorological coordinating infrastructure under the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM). The NSWP brings together the Federal agencies involved in providing space weather products and services, space weather research, users of space weather information, and other offices that set policy or funding for the Federal portion of the space weather enterprise. The purpose is to facilitate coordination, collaboration, and leveraging of activities, results, and capabilities across the Federal agencies. The participating agencies and their representatives are listed on the inside front cover of this book.

Program

This year's theme is, Implementing National Space Weather Strategy and Capabilities. We will follow a panel session format, including brief presentations by the expert panelists followed by ample time for lively exchange across a diverse group of attendees. The complete agenda is provided separately.

Congressional Sponsor
The Honorable Bill Nelson
United States Senator



Sen. Bill Nelson is a true son of Florida, his family coming to the Panhandle in 1829, and his grandparents homesteading in the early 20th Century on land that today is the Kennedy Space Center.

From a spot near there Nelson would launch into space in 1986 and spend six days orbiting the Earth aboard the space shuttle Columbia.

Nearly three decades later he still vividly recalls looking back at our planet from the window of the shuttle and not seeing any political, religious or racial divides.

"From that perspective, you can see how we're all in this together," he says. "If we could just remember that, we'd sure get a lot more done."

It's that kind of perspective that has earned Nelson a reputation as a thoughtful, moderate voice in an increasingly partisan political world.

Nelson's public service career began in 1972, with his election to the Florida Legislature. He then served six terms in the U.S. Congress representing Orlando and the Space Coast, becoming an early champion of the environment.

In 1994, Nelson was elected to the Florida Cabinet as state Treasurer, Insurance Commissioner and Fire Marshal. During his six years in the post, he showed he was a common-sense problem solver and strong consumer advocate.

Nelson was first elected to the U.S. Senate in November 2000. Since then, he's stood up to the insurance companies, Wall Street banks and Big Oil. He's exposed the lies of BP about the Gulf spill. And he's created a blueprint forward for our nation's space agency. Now in his third term, he's continuing to fight for lower taxes, better education, Medicare and Social Security.

He's someone who thinks public service is a noble calling - which is why he is devoted his life to serving his community, his state and his country.

Your NSWP Host

Dr. William "Bill" Leith
Senior Science Advisor for Earthquake and Geologic Hazards
United States Geological Survey

Dr. William (Bill) Leith is the Senior Science Advisor for Earthquake and Geologic Hazards at the U. S. Geological Survey (USGS). In this position, he oversees the Earthquake Hazards, Geomagnetism and Global Seismographic Network Programs, and represents the Department of the Interior within the National Space Weather Program. Dr. Leith previously served USGS as Chief of the USGS Special Geologic Studies Group from 1990-2001, as Senior Technical Advisor to the Assistant Secretary of State for Verification and Compliance, from 2001-2003, as the Coordinator of the Advanced National Seismic System from 2003-2012, and as USGS Acting Associate Director in 2010-2011. Bill has over 100 publications in the areas of seismology, geology, engineering geology, tectonics, and the applications of these subjects to earthquake safety, response and engineering, as well as to nuclear weapons testing and test monitoring, treaty verification and compliance assessments, and other national security interests.

October 20, 2015

Directions to the Hart Senate Office Building

Sponsored by The Honorable Bill Nelson, U.S. Senator

Room SH-902

Second and C streets NE, Washington, DC 20510

From the front of Union Station, walk across Columbus Circle to First St, N.E. Walk down First St, N.E. for two blocks, parallel to Lower Senate Park. Turn left at C St., N.E. Enter the Hart Building at the first entrance you see. Take the North elevators to the 9th floor, and follow the signs to SH-902.

Agenda

October 20, 2015, 12:30 pm – 4:30 pm

12:30 pm Registration

Session 1: Welcome and Opening Addresses

Session Coordinator: Mr. Michael Bonadonna, Office of the Federal Coordinator for Meteorology (OFCM)

1:00 pm Forum Welcome and Introduction

Dr. William Leith, Senior Science Advisor for Earthquake and Geologic Hazards U.S. Geological Survey USGS

1:15 pm Congressional Perspective

The Honorable Gary C. Peters, United States Senate

Session 2: National Space Weather Strategy

Session Coordinator: Mr. William Murtagh (OSTP)

1:30 pm In November 2014, as Chair of the National Science and Technology Council (NSTC), and on behalf of the President of the United States, Dr. John Holdren chartered the interagency Space Weather Operations, Research, and Mitigation (SWORM) Task Force. The Task Force is developing a National Space Weather Strategy that will articulate high-level strategic goals for enhancing our Nation's preparedness for a severe space weather event. SWORM Task Force members will share details of the National Strategy and provide an opportunity for input from forum attendees during the panel discussion.

Moderator: **Mr. William Murtagh**, Assistant Director for Space Weather, Office of Science and Technology Policy, Executive Office of the President

Speakers:

- **Dr. Tamara Dickinson**, Principal Assistant Director for Environment & Energy Office of Science and Technology Policy, Executive Office of the President
- **Dr. Louis Uccellini**, NOAA Assistant Administrator for Weather Services and Director, National Weather Service
- **Ms. Sarah Ellis Peed**, Acting Director for Infrastructure Protection Strategy, Policy, and Budget, Department of Homeland Security

Panelists:

- **Dr. Seth Jonas**, Science and Technology Policy Institute (STPI)
- **Mr. Andrew T. Sabata**, Emergency Management Specialist, National Planning Branch, Planning Division Response Directorate, FEMA
- **Dr. Thomas Berger**, Director, Space Weather Prediction Center, National Oceanic and Atmospheric Administration (NOAA)

2:45 pm Break

Session 3: Future Directions of Industry and their Space Weather Needs and Contributions

Session Coordinator: Dr. Devrie Intriligator (ACSWA)

3:00 pm As the need for space weather services and capabilities has expanded, so has public-private partnership for these services. In this session, panelists will describe how they are working to define and advance space weather requirements and capabilities available to government and the public.

Moderator: **Dr. Devrie Intriligator**, Director, Space Plasma Laboratory, Carmel Research Center Inc. and American Commercial Space Weather Association (ACSWA)

Panelists:

- **Dr. Steve Volz**, NOAA Assistant Administrator for Environmental Satellites and Information Services – "*The View from NESDIS: Engagement with the Commercial Space Weather Sector*"
- **Dr. Thomas Berger**, Director, Space Weather Prediction Center, National Oceanic and Atmospheric Administration (NOAA) – "*The View from SWPC: Utilizing the Diversity of the Commercial Space Weather Industry*"
- **Mr. Scott Rayder**, Senior Advisor to the President for Development and Partnerships, University Corporation for Atmospheric Research (UCAR) – "*Space Weather Research, Roles and Responsibilities and the Need for Legislation*"
- **The Honorable Jim Bridenstine**, United States Representative, "*The Importance of Potential Commercial Space Weather Contributions*"

  Presented by **Mr. Christopher Ingraham**, Senior Legislative Assistant, U.S. Rep. Jim Bridenstine

Featured Speaker
The Honorable Gary Peters
United States Senator

Elected in 2014, Senator Gary Peters is honored to represent the State of Michigan in the U.S. Senate. Throughout his career in public service, Gary has been a strong, independent voice for Michigan's families and small businesses. He has focused on uniting our communities by fighting for the things that we all agree on — a stronger economy, good-paying jobs, affordable health care, a secure retirement and a fair chance for everyone to succeed.

In the 114th Congress, Gary serves on the Senate Commerce, Science and Transportation Committee, the Homeland Security and Governmental Affairs Committee, the Small Business and Entrepreneurship Committee and the Joint Economic Committee.

In the U.S. Senate, Gary's top priority is to continue supporting job creation and economic growth to strengthen Michigan small businesses and our middle class. He is committed to working with members of both parties to find commonsense, practical and bipartisan solutions to the challenges facing Michigan and our nation.

For more than 20 years, Gary worked as an investment advisor, helping families save for their retirement and provide for their children's college education. However, he always felt the need to serve and give back to his community.

Gary volunteered for the U.S. Navy Reserve at age 34, where he earned a Seabee Combat Warfare Specialist designation and rose to the rank of Lieutenant Commander. After the September 11th terrorist attacks on our country, he volunteered again for drilling status.

First elected to the U.S. House of Representatives in 2008, with the country facing unprecedented economic challenges, Gary fought alongside Michigan workers to ensure the survival of our local auto industry. Today, Michigan's auto industry is strong and thousands of new jobs have been created in our state. Gary began his public service as a Rochester Hills City Councilman in 1991. In 1994, he was elected to the Michigan State Senate, where he had more bills signed into law than any other member of his party. Gary later served as the Michigan State Lottery Commissioner, where he generated a record amount of funding for our public schools.

In Congress, Gary has drawn on his business background to make Washington more transparent and accountable. He is leading efforts to eliminate wasteful, duplicative and unnecessary spending, and he is continually working to responsibly reduce the deficit. As a member of the House Financial Services Committee, Gary worked to hold bad actors on Wall Street accountable. Selected to serve on the Wall Street Reform Conference Committee, Peters played a central role in shaping the toughest financial reform law since the Great Depression. This landmark legislation eliminates future taxpayer-funded bailouts, bans the irresponsible behavior on Wall Street that caused the recession and provides commonsense financial protections for regular Americans.

Gary and his wife, Colleen, live in Oakland County and have three children: Gary Jr., Madeleine and Alana.

Moderator

Mr. William Murtagh

Assistant Director for Space Weather,

Office of Science and Technology Policy, Executive Office of the President

Bill Murtagh currently serves in the White House Office of Science and Technology Policy as the Assistant Director for Space Weather, Energy and Environment Division. In his position at OSTP he is overseeing the development of a national strategy on space weather. Bill is on detail from the National Oceanic and Atmospheric Administration (NOAA) where he is the Program Coordinator for the NOAA Space Weather Prediction Center (SWPC) in Boulder, Colorado.

Bill is NOAA's space weather lead in coordinating preparedness and response efforts with industry, emergency managers, and government officials around the world. He regularly briefs the White House, Congress, and government leadership on vulnerabilities of critical infrastructure to space weather storms. Bill is also a key contributor in U.S. government efforts to advance international cooperation in space weather-related activities.

He is a regular guest speaker at universities, government agencies, and national and international conferences. Bill has provided numerous interviews to major media outlets and is featured in several documentaries on space weather.

Before joining NOAA, Bill was a weather forecaster in the United States Air Force. He coordinated and provided meteorological support for national security interests around the world. Bill transferred to the SWPC in 1997 as a space weather forecaster and liaison between NOAA and the U.S. Air Force. He joined NOAA in 2003 after retiring from the Air Force with 23 years of military service.

Dr. Tamara Dickinson

Principal Assistant Director for Environment and Energy

White House Office of Science and Technology Policy (OSTP)

Dr. Tamara Dickinson is Principal Assistant Director for Environment and Energy at the White House Office of Science and Technology Policy (OSTP). As Principal Assistant Director, Dr. Dickinson oversees OSTP's work to address the challenges presented by climate change, to promote sustainable development, and to foster new and cleaner sources of energy. Dr. Dickinson also serves as Assistant Director for Disaster Resilience and Space Science, addressing issues related to disasters (natural and man-made), NASA space science programs, space weather, and general Earth Science.

Dr. Dickinson is on a detail from the U.S. Geological Survey where she previously served as the program coordinator for the National Geological and Geophysical Data Preservation Program and Geology Lab Program. Prior to joining USGS, Tammy held several positions at the National Research Council, including Senior Program Officer for the Committee on Earth Resources, Acting Associate Director for the National Materials Advisory Board and the Board on Manufacturing and Engineering Design, and Associate Director and Acting Director for the Space Studies Board. She has also served as the Program Director for the National Science Foundation's Petrology and Geochemistry Program and the Discipline Scientist for the Planetary Materials and Geochemistry Program at NASA Headquarters. Dr. Dickinson has held research positions at NASA Johnson and Goddard Space Centers and the Smithsonian Institution Natural History Museum where she focused on the origin and evolution of lunar materials and meteorites.

Dr. Dickinson was awarded the National Academies Individual Service Award in 2002, the Bureau of Land Management Sustainable Development Award in 2004, and the Department of Interior Superior Service Award in 2008. She has an asteroid (Asteroid 1981 EU22 Tammydickinson) named in honor of her research and program management work. Dr. Dickinson is a Fellow of the Geological Society of America.

Dr. Dickinson earned her B.A. from the University of Northern Iowa and M.S. and Ph.D. from the University of New Mexico.

Dr. Louis W. Uccellini

Assistant Administrator for Weather Services,

National Oceanic and Atmospheric Administration (NOAA), and

Director, National Weather Service

Dr. Louis W. Uccellini is the National Oceanic and Atmospheric Administration's Assistant Administrator for Weather Services, and Director of the National Weather Service. In this role, he is responsible for the day-to-day civilian weather operations for the United States, its territories, adjacent waters, and ocean areas.

Prior to this position, he served as the Director of the National Centers for Environmental Prediction (NCEP) for 14 years. He was responsible for directing and planning the science, technology, and operations related to NCEP's nine centers: Central Operations, Environmental Modeling Center, Ocean Prediction Center, Hydrometeorological Prediction Center, Climate Prediction Center, all in Camp Springs, MD; the National Hurricane Center in Miami, FL; Storm Prediction Center in Norman, OK; Space Weather Prediction Center in Boulder, CO; and the Aviation Weather Center in Kansas City, MO.

Dr. Uccellini was the Director of the National Weather Service's Office of Meteorology from 1994 to 1999, Chief of the National Weather Service's Meteorological Operations Division from 1989 to 1994, and section head for the Mesoscale Analysis and Modeling Section at the Goddard Space Flight Center's Laboratory for Atmospheres from 1978 to 1989.

Dr. Uccellini received his Ph.D. (1977), Master (1972) and Bachelor of Science (1971) degrees in meteorology from the University of Wisconsin-Madison. He has published more than 60 peer-reviewed articles and chapters in books on subjects including analysis of severe weather outbreaks, snowstorms, gravity waves, jet streaks, cyclones, and the use of satellite data in analysis and modeling applications. He is the co-author of a widely acclaimed two-volume American Meteorological Society (AMS) monograph Northeast Snowstorms, published in 2004, and authored chapters in the 1990 AMS publication Extratropical Cyclones, the 1999 AMS publication The Life Cycles of Extratropical Cyclones, and the 2008 AMS publication Synoptic Dynamic Meteorology and Weather Analysis and Forecasting.

Dr. Uccellini has served on many national and international research and field experiment programs. He has received many awards in recognition of his research and operational achievements including the Maryland Academy of Sciences Distinguished Young Scientist Award (1981), the NASA Medal for Exceptional Scientific Achievement (1985), the AMS's prestigious Clarence Leroy Meisinger Award (1985), and the National Weather Association's Research Achievement Awards for Significant Contributions to Operational Meteorology (1996). He was elected as a Fellow to the AMS in 1987and served as Co-Chief Editor of Weather and Forecasting from 1988-1992. In 2001 he received the U.S. Presidential Meritorious Executive Rank Award and in 2006 he received the U.S. Presidential Distinguished Rank Award. In January 2012, Dr. Uccellini was elected the President of the AMS and served from 2012 to 2013.

Session 2: National Space Weather Strategy

Sarah Ellis Peed

DHS

Panelists

Dr. Seth Jonas

Science and Technology Policy Institute (STPI)

Seth Jonas works at the Science and Technology Policy Institute (STPI) where he provides objective technical and policy analysis to the White House and other executive branch departments and agencies. He has experience in policy analysis, strategy and metric development, program evaluation, and quantitative analysis across a broad range of topics and agencies. Select areas of study include space weather, hazard preparedness, infrastructure security and resilience, Federal Government continuity programs, national security, and emergency preparedness communications. Dr. Jonas has held fellowships at Los Alamos National Laboratory, Brookhaven National Laboratory, and with the JASON scientific advisory group for U.S. national security. He holds an MA and a PhD in physics from Johns Hopkins University, and two BS degrees from the University of Central Florida in physics and liberal science studies (math and chemistry).

Mr. Andrew Sabata

Emergency Management Specialist

Response Directorate Planning Division, Federal Emergency Management Agency

Mr. Sabata is the lead planner for the Power Outage Incident Annex (POIA) to the Federal Interagency Operations Plans for Response and Recovery, and is coordinating FEMA's participation in the development of the National Space Weather Strategy for the Office of Science and Technology Policy. As a Future Planning Unit Leader in the National Response Coordination Center, Mr. Sabata has responded to numerous federally-declared disasters including the Boston Marathon bombing, Norman Oklahoma tornado, and Colorado flooding.

Mr. Sabata is a Major in the United States Army Reserves assigned as an Engineer Plans Officer in the Office of the Chief of Engineers of the United States Army Corps of Engineers. Prior to arriving at FEMA, Mr. Sabata was the J35 Future Operations Officer for the Ohio National Guard where he developed the first-in-the-nation Regional Response Plan for the FEMA Region V CBRN Response Enterprise. Mr. Sabata holds a Master of Science in Engineering Management from the University of Missouri-Rolla. He earned his commission at the United States Military Academy, graduating with a Bachelor of Science in Military History

Dr. Thomas Berger

Director, NOAA/SWPC

Dr. Thomas Berger joined NOAA in 2014 as the director of the Space Weather Prediction Center (SWPC). Tom directs a staff of approximately 40 federal employees and an equal number of cooperative institute and contract employees in NOAA's Boulder, Colorado, facility. SWPC works closely with other federal agencies including the United States Air Force, Department of Homeland Security, NASA, and NSF, as well as the commercial sector and academia, to provide critical infrastructure operators and other customers operational products and services needed to operate in the space weather environment.

Dr. Berger previously worked at the Lockheed Martin Solar and Astrophysics Lab in Palo Alto, California, where he was the head of ground-based solar observing and a co-Investigator on the Solar Optical Telescope instrument of the Japanese/US/UK Hinode mission. Most recently, he led the development of the Solc filter instrument for NASA's Interface Region Imaging Spectrograph Small-Explorer mission, and was Project Scientist on the Daniel K. Inouye Solar Telescope being constructed on the island of Maui, Hawaii..

Moderator

Dr. Devrie S. Intriligator

Director, Space Plasma Laboratory, Carmel Research Center, Inc.

ACSWA Executive Committee

Dr. Devrie S. Intriligator is a leading space weather prediction expert. She has published more than 140 papers in refereed publications, 100 as principal author, many at the forefront of space plasma physics and space weather. Her expertise includes space weather measurements, simulations, modeling, and predictions for operational excellence. Her team at Carmel Research Center provides services to spacecraft, aviation, astronauts, space-tourism, ground-based electric power, and pipelines. An Executive Committee member of the American Commercial Space Weather Association (ACSWA), Intriligator chairs the Annual NOAA SWPC-Commercial Sector Summits.

Dr. Intriligator has served as chair of the National Academy of Sciences Committee on Solar-Terrestrial Research. She co-chaired (with Dr. Herbert Friedman) the NAS-NRC study “Solar-Terrestrial Research for the 1980s” and chaired the NAS-NRC study “National Solar-Terrestrial Research Program.” These studies led to current satellite missions and programs including the National Space Weather Program. Dr. Intriligator has presented numerous briefings to key U.S. government officials, including the President’s Science Advisor.

Dr. Intriligator’s plasma investigations have revealed fundamental physical and space weather processes. Experiments on which she was a co-investigator, aboard Pioneer 10 to Jupiter and Pioneer 11 to Jupiter and Saturn, were the first to measure phenomena including space weather at these planets. Now both spacecraft are among the farthest manmade objects from Earth. Dr. Intriligator also was a key investigator on experiments aboard Pioneer Venus Orbiter and on heliocentric spacecraft Pioneer 6, 7, 8, and 9. She participated in all phases of mission and experiment development including initial conception, instrument design, spaceflight operations, data analyses, and publications. Dr. Intriligator is an inventor of cosmic ray and space plasma detectors. She was the first U.S. scientist invited to place an experiment on a Soviet spacecraft.

Dr. Intriligator’s professional experience includes: physics faculty member, University of Southern California; Visiting Associate and Research Fellow, California Institute of Technology; and Resident Research Associate, NASA Ames Research Center. She has served as a member of numerous boards and study groups at the National Academy of Sciences, National Research Council. She was the first woman to chair the NAS-NRC Committee on Solar-Terrestrial Research.

Dr. Intriligator holds S.B. and S.M. degrees from the Massachusetts Institute of Technology, and a Ph.D. from UCLA.

Dr. Stephen Volz

NOAA Assistant Administrator for Satellite and Information Services

Responding to an ever-growing demand for environmental information, NOAA seeks to maintain an observing enterprise that is flexible, responsive to evolving technologies, and economically sustainable, while supporting and upholding NOAA's strong commitment to public safety and the international data sharing system upon which NOAA depends for global data. In recent years, the commercial sector has made significant investments in new remote sensing technologies, as well as new approaches to build, launch, and operate satellites more efficiently. NOAA seeks to take advantage of all available capabilities that can help us meet our observing requirements, including commercial options.

NOAA recently posted a draft Commercial Space Policy that establishes the broad principles for the use of commercial space-based approaches for NOAA's observational requirements. NESDIS, as the Satellite and Information Service of NOAA, secures the assets to meet those requirements, and will soon release the process NESDIS will follow when engaging with the commercial sector and determining their ability to meet NOAA's needs, all in accordance with the NOAA Commercial Space Policy.

In the area of space weather, NOAA has been monitoring interest in the commercial sector for providing solar wind data for over a decade through multiple Requests for Information (RFIs) and Broad Area Announcement (BAA) awards. NOAA most recently released an RFI in January 2014, requesting prices for the purchase of solar wind data from the Sun-Earth L1 region similar to that on DSCOVR and ACE with some minor additions. NOAA also requested prices for a hosted payload for a Compact Coronagraph (CCOR). The responses indicated that there is interest and potential capability in the private sector for providing such data, although at present only concepts exist for commercially-provided data. NESDIS also released an RFI on GNSS-RO commercial capabilities in September 2014, with the goals of understanding the range of options available to purchase commercial radio occultation data and evaluating the current capabilities of potential suppliers. NESDIS will continue to engage with the commercial space weather sector in accordance with the NOAA Policy and NESDIS Process once finalized.

BIOGRAPHY

Dr. Stephen Volz is the NOAA Assistant Administrator for Satellite and Information Services. In this role Dr. Volz leads the acquisition and operation of the nation’s civil operational environmental satellite system.

Dr. Volz previously served as the Associate Director for Flight Programs in the Earth Science Division of NASA’s Science Mission Directorate. Dr. Volz has 26 years professional experience in aerospace. Prior to serving as the Flight Program Director, Dr. Volz was the Earth Science program executive for a series of Earth Science missions, and he led the Senior Review for the Earth Science operating missions. Dr. Volz worked in industry at Ball Aerospace and Technologies Corporation from 1997–2002. From 1986–1997 Dr. Volz worked for NASA’s Goddard Space Flight Center as an instrument manager, an I&T Manager, a systems engineer, and a cryogenic systems engineer.

Dr. Volz has a doctorate in Experimental Condensed Matter Physics from the University of Illinois at Urbana-Champaign (1986), a master’s in Physics from Illinois (1981), and a bachelor’s in Physics from the University of Virginia (1980). He has more than 20 publications in peer-reviewed journals.

The View from SWPC: Utilizing the Diversity of the Commercial Space Weather Industry

Dr. Thomas Berger

Director, NOAA/SWPC

The American commercial space weather industry is a vital and growing part of the space weather enterprise that can potentially play an increasing role in the strategic development of NOAA's space weather capabilities. With the recent Space Weather Operations Research and Mitigation (SWORM) task force effort to craft a National Space Weather Strategy (NSWS), NOAA is undergoing a review of the baseline operational observing architecture necessary to ensure that our nation sustains its ability to forecast and warn of space weather events that threaten critical infrastructure. As part of this effort, NOAA's Space Weather Prediction Center (SWPC) is exploring new space-based instruments and measurement techniques to better characterize the near-Earth space environment and deep space solar wind and coronal mass ejections. NOAA will continue to work with the commercial sector to explore cost-effective solutions to these challenges as we maintain and evolve the civil operational space weather observing system.

In the terrestrial measurement arena, commercial vendors are producing novel observations such as Arctic ionospheric scintillation profiles that may prove useful for operational forecasts of GPS reception in this important region, as well as measurements of radiation levels at commercial aircraft altitudes that could provide timely alerts to airlines during extreme space weather events. NOAA also continues to define and support new Small Business Innovation Research (SBIR) grant opportunities for solar flare prediction, GPS system disturbance alerts, helioseismic imaging of the far-side of the Sun, deep space antenna network systems, and other crucial enabling technologies for operational space weather forecasting.

NOAA/SWPC is committed to working with the commercial space weather industry as we implement the NSWS while continuing to provide free and open access to all space weather data, model results, and products, enabling our commercial partners to provide value-added services that enhance our national protection from, and response to, space weather events.

BIOGRAPHY

Dr. Thomas Berger joined NOAA in 2014 as the director of the Space Weather Prediction Center (SWPC). Tom directs a staff of approximately 40 federal employees and an equal number of cooperative institute and contract employees in NOAA's Boulder, Colorado, facility. SWPC works closely with other federal agencies including the United States Air Force, Department of Homeland Security, NASA, and NSF, as well as the commercial sector and academia, to provide critical infrastructure operators and other customers operational products and services needed to operate in the space weather environment.

Dr. Berger previously worked at the Lockheed Martin Solar and Astrophysics Lab in Palo Alto, California, where he was the head of ground-based solar observing and a co-Investigator on the Solar Optical Telescope instrument of the Japanese/US/UK Hinode mission. Most recently, he led the development of the Solc filter instrument for NASA's Interface Region Imaging Spectrograph Small-Explorer mission, and was Project Scientist on the Daniel K. Inouye Solar Telescope being constructed on the island of Maui, Hawaii. Dr. Berger has a Ph.D. degree in applied physics/astrophysics, and an M.S. degree in mechanical engineering/fluid mechanics, both from Stanford University. He received his B.S. degree in engineering physics from University of California, Berkeley in 1985.

Mr. Scott Rayder

Senior Advisor to the President

University Corporation for Atmospheric Research (UCAR)

America's research community is currently positioned to provide "best in class" capability to deliver real time forecasting of space weather events. The COSMIC 2 constellation, COSMO ground-based space telescope and WACCM-X model are examples of research efforts that hold great potential to ameliorate and protect assets on earth from space weather in ways that were not envisioned 20 years ago. These efforts, coupled with the recent launch and placement of DSCVR are landmark achievements for the space weather community. This current position is a result of past research investments, however, a clearly defined path to move this research into operations is needed so that the nation can capitalize on these efforts and operationalize them in a society that is ever more dependent on spaced based assets.

Setting priorities for research, and research that will move to operations is essential for the space weather community. The path ahead must clearly define the role of federal agencies, universities, the private sector and FFRDC's such that we can employ these capabilities in the most efficient and effective manner possible. Fortunately, we have a guide, that being, the evolution of the U.S. Weather Bureau into the current National Weather Service. From the Fairweather report in 2003 and from current legislative efforts in Congress, we must assess the need for legislation as a driver for space weather efforts and use legislation to bring space weather the attention and resources it needs.

BIOGRAPHY

Scott Rayder provides strategic direction on budget and policy issues for the University Corporation for Atmospheric Research (UCAR), which oversees the National Center for Atmospheric Research (NCAR). He brings extensive experience in building relationships and opportunities with a wide range of funding organizations, including the U.S. Dept. of Energy, the National Science Foundation, the National Oceanic and Atmospheric Administration, the U.S. Geological Survey, the Federal Emergency Management Agency and the Department of Defense, as well as private sector companies. Scott has worked with senior officials in the federal executive branch as well as Congress, focusing on programs supporting weather forecasting, climate monitoring, and environmental analysis. As Chief of Staff to NOAA Administrator Vice Admiral Conrad C. Lautenbacher, Jr., U.S. Navy (Retired), Scott was charged with formulating, guiding and integrating policy, budget, and program initiatives with senior management to ensure consistency across its diverse program responsibilities, both within NOAA and with NOAA's partnering organizations. Prior to this, Scott was the Director of Government Relations at the Consortium for Oceanographic Research and Education (CORE). Scott was also a professional staff member with the House Committee on Science, where he gained valuable experience overseeing a number of programs/issues that included the Advanced Technology Program, Mir Space Station, U.S. ocean science programs, and U.S. satellite technologies. Scott was awarded a Presidential Management Intern position with NOAA's Office of Oceanic and Atmospheric Research. After several years there, Scott went on to NOAA's Office of Constituent Affairs, where he worked with stakeholders to improve the delivery of services to its customers. Scott has a B.A. from Hamilton College with a dual major in Government and Geology. He earned a Masters in Public Administration from the Maxwell School of Citizenship and Public Affairs at Syracuse University. Scott and his wife, Catherine, have five children.

Congressman Jim Bridenstine

OK-1, Republican

Congressman Jim Bridenstine was first elected in 2012 to represent Oklahoma's First District, which covers Washington, Tulsa, Wagoner Counties plus portions of Rogers & Creek Counties. He was unopposed in 2014, re-elected to a second term.

Bridenstine serves on the House Armed Services Committee and the Science, Space and Technology Committee. He chairs the Environment subcommittee in SST and serves on the Oversight subcommittee. He serves on two HASC subcommittees also: Strategic Forces and Sea Power and Projection Forces.

From his first days in the House, Jim Bridenstine has been widely recognized for his integrity, principled stand on issues, and commitment to upholding the rule of law and the Constitution. He has become an effective member of Congress by focusing on three specific areas: National Security, Economic Freedom, and Constitutional Integrity. Jim supports moving toward a balanced budget through controlling federal spending, tax reform, and policies promoting free markets.

The Congressman's background includes a triple major at Rice University, a MBA from Cornell University, and 9 years active duty in the United States Navy, and he is an Eagle Scout. Bridenstine began his Naval aviation career flying the E-2C Hawkeye off the aircraft carrier USS Abraham Lincoln. It was there that he flew combat missions in Iraq and Afghanistan and gathered most of his 1,900 flight hours and his 333 carrier arrested landings. While on active duty, he transitioned to the F-18 Hornet and flew at the Naval Strike and Air Warfare Center, the parent command to TOPGUN. He served as a Lieutenant Commander in the U.S. Navy Reserve where he flew the E-2C Hawkeye in America's war on drugs before becoming a member of Congress. In 2015 Jim transitioned to the Oklahoma Air National Guard where he flies the MC-12.

He and his wife Michelle live in Tulsa with their three children, ages 9, 7, and 3.

Active Duty: 1998-2007, transition to NSAWC 2004. Navy Reserve 2010 to 2015. Oklahoma Air National Guard 2015 to present.

Christopher Ingraham

Christopher Ingraham is Congressman Bridenstine's Senior Legislative Assistant. In his role he handles a wide issue portfolio, including the Congressman's duties as Chairman of the Subcommittee on the Environment of the House Science, Space and Technology Committee, which has jurisdiction over NOAA. Before working for Rep. Bridenstine, he was a Legislative Assistant in the office of Rep. Trey Gowdy (SC). He is a graduate of the University of South Carolina Honors College with a degree in Political Science.

The American Commercial Space Weather Association (ACSWA) protects America's economic strength and national security. In today's technologically-dependent world, infrastructures like GPS signals face risks from space weather events. Electricity and telecommunications, both civilian and military, are also at risk. Recent reports (2008 US National Research Council study) estimate a major space weather event could cost the US economy trillions of dollars.

ACSWA companies supply important products and services. In conjunction with its member companies, ACSWA is playing a vital role by identifying important data and technology gaps that can be filled by commercial or government actions, including buying observational data from commercially owned and operated ground-based and space-based assets. ACSWA members also develop value-added products and services for the benefit of human and property safety as well as for vibrant commerce. Member companies supply risk and threat analyses, build small satellites, develop ground-based and space-based instrumentation, perform data analysis and data product development, numerical modeling and simulation, sensor modeling, data assimilation, and calibration/validation.

ACSWA serves as the collective voice for the commercial space weather industry. Since its inception in 2010 with five companies, ACSWA has quadrupled in size and now represents 19 different providers of space weather products and services. ACSWA serves as an efficient conduit for information between various organizations and the commercial space weather industry. ACSWA is able to lobby and negotiate with government and other organizations as a collective whole. ACSWA has been an effective advocate for space weather, space weather partnerships, and public/commercial initiatives. Examples include: launch of the DSCOVR spacecraft (NOAA, NASA, USAF), NOAA SWPC funding, USAF/NSF ground-based solar observatories, USGS ground-based magnetic observatories, NSF and other ground-based neutron monitors and ground- based radars.

ACSWA – Building a strong space weather enterprise

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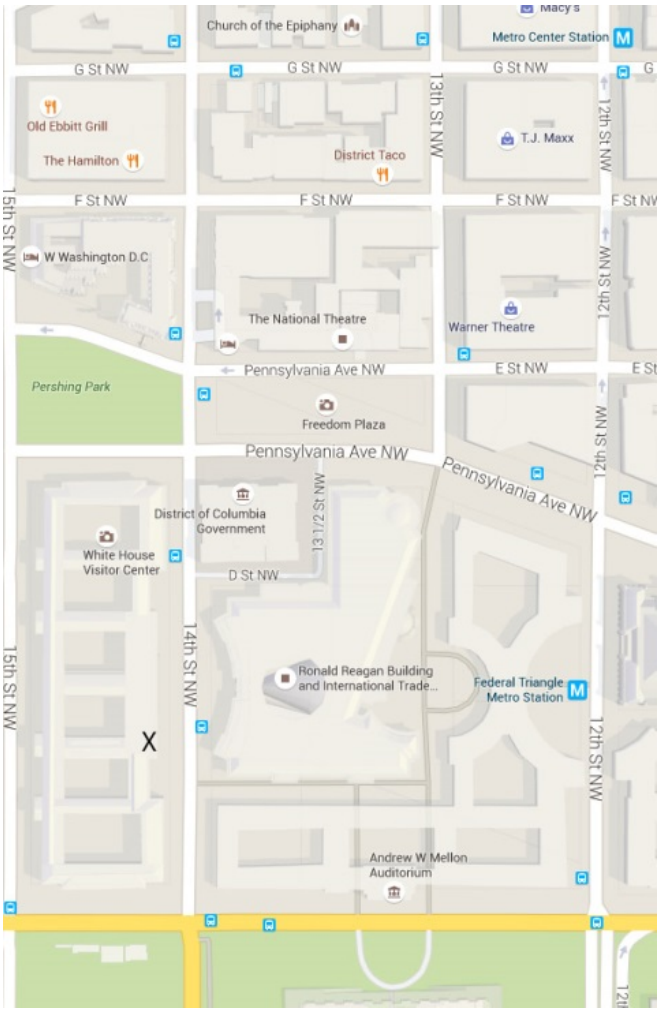
October 21, 2015

Herbert C. Hoover Building

Commerce Auditorium

1401 Constitution Avenue, NW, Washington, D.C., 20230

Map and directions



Surface directions to the Herbert C. Hoover Building:

Walk South on 14th Street, N.W., on the East side of the street (J.W. Marriott/Reagan Building side). After crossing Pennsylvania Avenue N.W., walk to the light on the far side of the Reagan Building, in front of U.S. Customs and Border Control. Cross 14th Street, and enter the Herbert C. Hoover Building via Entrance No. 7.

October 21, 2015, 8:00 am – 1:00 pm

8:00 am Registration

Session 4: Welcome and Opening Addresses

Session Coordinator: Mr. Michael Bonadonna (OFCM)

8:30 am Forum Welcome and Introduction

Dr. William Leith, Senior Science Advisor for Earthquake and Geologic Hazards U.S. Geological Survey USGS

8:45 am Keynote Speaker

Dr. Steven Volz, NOAA Assistant Administrator for Environmental Satellites and Information Services

9:15 am: Break

Session 5: Understanding the Impacts of Space Weather

Session Coordinator: Ms. Dianne Suess (NOAA-SWPC)

9:30 am The Nation faces many uncertainties from increasing reliance on space weather-affected technologies for communications, navigation, security, electrical power generation and distribution, and other activities. This session will focus on the impacts of space weather that occur frequently but are absorbed by the technological infrastructure and seldom noticed by the public.

Moderator: **Dr. Thomas Berger**, Director NOAA Space Weather Prediction Center

Panelists:

- **Mr. Frank Koza**, Executive Director, Operations Support, PJM Interconnection
- **Mr. Richard Heuwinkel,** Manager of Operations Planning Services, Weather Plans and Requirements, FAA Air Traffic Organization
- **Dr. Jeffrey Love**, Research Geophysicist, Advisor for Geomagnetic Research, US Geological Survey (USGS)
- **Dr. Robert P. McCoy**, University of Alaska Fairbank/Geophysical Institute

11:00 am: Break

Session 6: Space Weather Observing Systems

Session Coordinator: Ms. Carol Finn (USGS)

11:15 am A fundamental step towards understanding space weather phenomena and their impacts is to detect, monitor, and observe space weather conditions from the sun, through interplanetary space, within the Earth's magnetosphere, atmosphere, and surface. In this session, panelists will describe both space- and ground-based observing systems used for research and operational space weather services.

Moderator: **Dr. Matthew Heavner**, Assistant Director for Nuclear and Space Security Office of Science & Technology Policy, Executive Office of the President

Panelists:

- **Dr. Steven Clarke**, Director, Heliophysics Division, Headquarters, National Aeronautics and Space Administration
- **Mr. Ralph Stoffler**, Director of Weather, Headquarters, United States Air Force
- **Dr. Vladimir Papitashvili**, Acting Head, Geospace Section, National Science Foundation
- **Mr. John Pereria**, Deputy Director, Office of Projects, Planning and Analysis, National Environmental Satellite, Data and Information Service

Session 7: Summary and Wrap-Up

Session Coordinator: Mr. Michael Bonadonna (OFCM)

12:45 pm Forum Wrap-up and Take Away

Mr. Michael Bonadonna (OFCM)

12:55 pm Closing Remarks

Dr. William Leith, Senior Science Advisor for Earthquake and Geologic Hazards U.S. Geological Survey USGS

Keynote Address
Stephen Volz
Assistant Administrator for Satellite and Information Services

Dr. Stephen Volz is the NOAA Assistant Administrator for Satellite and Information Services. NOAA's Satellite and Information Service is dedicated to providing timely access to global environmental data from satellites and other sources to promote, protect and enhance the Nation's economy, security, environment and quality of life. In this role Dr. Volz leads the acquisition and operation of the nation's civil operational environmental satellite system. He also leads efforts for research and development of products and programs to archive and provide access to a variety of Earth observations via three national data centers.

Dr. Volz is a leader in the international Earth observation community, serving as the NOAA Principal to the Committee on Earth Observation Satellites (CEOS). In this capacity he leads efforts to coordinate global satellite-based observations among international space agency partners to further the development of a Global Earth Observation System of Systems. In addition, Dr. Volz serves as the Co-Chair of the NOAA Observing Systems Council, a group that coordinates observing systems requirements and provides resource recommendations for NOAA's observation platforms. He is also a member of the NOAA Executive Council, NOAA's executive decision-making body.

Dr. Volz previously served as the Associate Director for Flight Programs in the Earth Science Division of NASA's Science Mission Directorate. As the Program Director, Dr. Volz managed all of NASA's Earth Science flight missions and associated activities. Within this flight portfolio, Dr. Volz managed a line of Principle Investigator (PI) led missions in airborne science, small

satellites, and instrument missions of opportunity, including the development of the Announcements of Opportunity to solicit the science and mission proposals, along with their subsequent evaluation and selection. Steve managed within the flight program a suite of Distributed Active Archive Centers (DAACs) that process, distribute, and archive all of NASA's Earth science data, as well as the science research data products developed from these and other satellite remote-sensing data. Dr. Volz worked with domestic and international space agencies to actively support and promote partnerships and collaboration to further NASA and the nation's Earth science remote-sensing objectives, and to maximize the beneficial utilization of NASA's Earth science data.

Dr. Volz has 26 years professional experience in aerospace. Prior to serving as the Flight Program Director, Dr. Volz was the Earth Science program executive for a series of Earth Science missions, including EO-3 GIFTS, CloudSat, CALIPSO, and ICESat, and he led the Senior Review for the Earth Science operating missions. Dr. Volz worked in industry at Ball Aerospace and Technologies Corporation from 1997–2002, where he was the Project Manager for the Space Infrared Telescope Facility superfluid helium cryostat and other flight projects. From 1986–1997 Dr. Volz worked for NASA's Goddard Space Flight Center as an instrument manager, an I&T Manager, a systems engineer, and a cryogenic systems engineer on missions and instruments including the Cosmic Background Explorer (COBE), among others.

Dr. Volz is a member of several professional societies, including the American Physical Society (M'82), the American Astronomical Society (M'87), the American Geophysical Union (M'02), and the American Meteorological Society (M'08). He is a senior member of the Institute of Electrical and Electronics Engineers (IEEE), an active member of and participant in the Geoscience and Remote Sensing Society (GRSS), and a member of the GRSS Administration Committee (AdCom) for the period of 2013–2017. He is the recipient of several awards, including the Silver Snoopy Award from NASA's astronaut team in 1994 for his work as the instrument manager and team lead for the Space Shuttle cross bay mounted Superfluid Helium On Orbit Transfer (SHOOT) experiment, the Goddard Space Flight Center John Boeckel Award for Engineering Excellence (1992), and the Ball Corporation Award of Excellence from the Ball Aerospace and Technology Corporation (BATC) in 2001.

Dr. Volz has a doctorate in Experimental Condensed Matter Physics from the University of Illinois at Urbana-Champaign (1986), a master's in Physics from Illinois (1981), and a bachelor's in Physics from the University of Virginia (1980). He has more than 20 publications in peer-reviewed journals.

Dr. Volz is a native-born Washingtonian, and lives in Bethesda with his wife Beth and his two teenage daughters.

See more at: http://www.nesdis.noaa.gov/leadership.html

Moderator

Dr. Thomas Berger

Director, NOAA/SWPC

Dr. Thomas Berger joined NOAA in 2014 as the director of the Space Weather Prediction Center (SWPC), the nation's official source for civil space weather watches, warnings, and alerts. Tom is responsible for leading the strategic direction, operational planning, and execution of the SWPC mission, directing a staff of approximately 40 federal employees and an equal number of cooperative institute and contract employees in NOAA's Boulder, Colorado, facility. SWPC works closely with other federal agencies including the United States Air Force, Department of Homeland Security, NASA, and NSF, as well as the commercial sector and academia, to provide critical infrastructure operators and other customers the products and services necessary to operate in the space weather environment.

Dr. Berger is an expert in solar and space physics with a specialization in optical and ultraviolet instrumentation and data analysis for ground- and space-based observation of the Sun. He began his career at the Lockheed Martin Solar and Astrophysics Lab of the Advanced Technology Center in Palo Alto, California, where he was the head of ground-based solar observing and a co-Investigator on the Solar Optical Telescope instrument of the Japanese/US/UK Hinode satellite mission. Most recently, he led the development of the Solc filter instrument for NASA's Interface Region Imaging Spectrograph Small-Explorer mission, and was Project Scientist on the Daniel K. Inouye Solar Telescope being constructed on the island of Maui, Hawaii. Dr. Berger has a Ph.D. degree in applied physics/astrophysics, and an M.S. degree in mechanical engineering/fluid mechanics, both from Stanford University. He received his B.S. degree in engineering physics from University of California, Berkeley.

Frank J. Koza

Executive Director, Infrastructure Planning

PJM Interconnection, LLC

Severe space weather has the potential to create major issues on the interconnected bulk power system. Coronal mass ejections (CMEs) impacting the earth's magnetosphere can generate significant ground induced currents (GICs) that travel in the ground or in the transmission lines and enter/exit the power system through the high voltage transformers. Such events can cause transmission line outages and in the worst of circumstances, blackout. In addition, transformer heating can also result, potentially leading to damage or failure.

In order to ensure that the reliability of the bulk power system is preserved, even under severe space weather conditions, power system operators and planners employ a number of techniques. Emergency messaging from the Space Weather Prediction Center alerts the operators to the potential of space weather events. In addition, NERC is in the process of implementing mandatory reliability standards for planning and operations which will place requirements on planners and operators to have processes to mitigate the risks. Analytical tools and processes are now becoming available for planners to develop engineered mitigation to reduce the risks.

BIOGRAPHY

I have worked at PJM over 14 years, previously in charge of system operations. Presently, I am Executive Director of Infrastructure Planning and in charge of the technical staff associated with generator interconnection and implementation of transmission enhancements. I am Chair of the NERC Geomagnetic Disturbance Standard Drafting Team and former Chair of the NERC Operating Reliability Subcommittee.

Previously, I worked for 29 years at Exelon/PECO Energy in a variety of assignments including construction of fossil and nuclear generation facilities, construction and maintenance of transmission, system planning, and system operations.

Mr. Richard J. Heuwinkel

Manager of Operations Planning Services, Weather Plans and Requirements, FAA Air Traffic Organization

Space weather events are increasingly recognized as threats to the continued operation of many core infrastructure systems in the United States. The ground-based, aircraft-based, and space-based systems necessary to maintain and operate the U.S. National Airspace System (NAS), as well as the global aviation system, are no exception. U.S and international air carriers have greatly increased the use of high latitude routes to save fuel, and money, on long-haul, trans-oceanic flights. Aircraft operating on these routes are more susceptible to the effects of space weather events, including loss of communications and navigation capabilities. All aircraft operating in the NAS, from light, piston-driven general aviation aircraft to large, transport category airliners, are increasingly dependent on cellular and satellite communications capabilities for required navigation, communications, and surveillance services. The impacts of space weather events on aircraft can cause operational problems for Air Traffic Control which is responsible for the separation and the orderly flow of aircraft within the NAS and into and out of U.S. Flight Information Regions.

The potential risks to aviation operations in the NASA and internationally posed by space weather events have increased substantially over the last 10 years as air carriers expand the use of high latitude routes and aviation navigation and communication systems increasingly rely on satellite-based technology. The FAA is responsible for mitigating the operational risks of space weather events through the development of policies, procedures, and standards for conducting operations when space weather events are observed or forecast to occur. This requires improved space weather information that can be integrated into decision support systems and tools used by aviation decision-makers.

BIOGRAPHY

Rick Heuwinkel is the Manager of NextGen Aviation Weather Division, Advanced Concepts & Technology Development Office, Federal Aviation Administration In this role, he manages the four branches within the Aviation Weather Division that are collectively responsible for planning and developing the weather information and capabilities necessary to support implementation of the Next Generation Air Transportation System (NextGen). Mr. Heuwinkel oversees the activities of the FAA's Aviation Weather Research Program, the Weather Technology in the Cockpit program, the Reduce Weather Impact program, and the Multi-Phased Array Radar program. In addition, he is responsible for developing aviation weather policy regarding the provision and use of weather information and harmonizing weather information standards for NextGen with the International Civil Aviation Organization (ICAO), the European Organization for the Safety of Air Navigation, and the Single European Sky Air Traffic Management Research Joint Undertaking.

In his current position, Mr. Heuwinkel facilitates intra- and inter-agency collaboration to leverage multiple aviation weather projects to develop operational improvements to meet NextGen requirements for weather information. He works with multiple FAA lines of business, including the Air Traffic Organization, to develop requirements for the integration of weather information into NextGen decision support processes and tools. Mr. In addition, Mr. Heuwinkel represents the U.S. Meteorological Authority at various ICAO meetings and he is the U.S. member on the ICAO Meteorology Panel. He frequently represents the FAA on the Interdepartmental Committee for Meteorological Services and Supporting Research led by the Office of the Federal Coordinator for Meteorology.

Session 5: Understanding the Impacts of Space Weather

Mr. Heuwinkel has worked on aviation weather programs in the FAA for over 25 years. Prior to joining the FAA, he worked for 10 years in policy and program planning at the National Oceanic and Atmospheric Administration (NOAA). Before working for NOAA, Mr. Heuwinkel spent 8 years with the Environmental Protection Agency. Mr. Heuwinkel earned a Masters degree in Political Science and Economics from Iowa State University and a Master of Business Administration degree from Stanford University.

Dr. Jeffrey J. Love

Geomagnetism Program

U.S. Geological Survey

On the challenge of mapping storm-time geoelectric fields

The primary challenge in assessing space-weather related risk for the electric-power grid industry comes from our limited knowledge of the conductivity of the solid Earth. As the result of geological and tectonic history, the structure of the Earth is heterogeneous: with localized differences in topography, mineralogy, water content, and chemistry giving rise to a three-dimensional (3D) distribution in electrical conductivity. This means that, over a given geographic region where storm-time geomagnetic activity might be relatively homogeneous, the induced geoelectric field can be very different from one location to another. The relationship between geomagnetic activity and the induced geoelectric field is known as “impedance” – a quantity that can be directly estimated, at a given site, by simultaneous measurement of geomagnetic and geoelectric fields. We use impedances obtained during a survey of the north-midwestern United States to examine the feasibility of mapping the magnetic-storm induction of geoelectric fields. We calculate geoelectric fields that would be induced by a uniform geomagnetic field that varies sinusoidally with a 100 second oscillation period that is characteristic of a magnetic storm. Induced geoelectric fields show substantial geographically distributed differences in amplitude, direction, and phase. An extremely intense magnetic storm having 500 nT amplitude at 100 seconds would induce geoelectric fields with an average amplitude of about 2.71V/km, but a wide site-to-site range of 0.15 V/km to 16.77 V/km; the smaller geoelectric field intensities might be considered acceptable for grid operators, but the larger values could be hazardous. This work highlights the possible inadequacy of 1D conductivity models for evaluating storm-time geoelectric hazards for the electric-power grid industry. Significant improvements in the evaluations of such induction hazards will require much more detailed knowledge of the Earth's interior 3D conductivity structure.

BIOGRAPHY

Dr. Jeffrey J. Love has worked at the U.S. Geological Survey since 2001. As the USGS Advisor for Geomagnetic Research, he provides guidance for the Geomagnetism Program and the Natural Hazards Mission. Nationally, Dr. Love represents the Department of the Interior on the National Space Weather Program committee. He is participating in the Office of Science and Technology Policy’s project for Space Weather Operations Response and Mitigation and in NASA’s International Living with a Star Institute for Geomagnetically Induced Currents. Internationally, Dr. Love has served on the Executive Council and has been Chairman of INTERMAGNET.

Dr. Love received his A.B. in Physics in 1985 from the University of California, Berkeley and his Ph.D. in Geophysics in 1993 from Harvard University. Prior to arriving at the USGS, he worked at the University of Leeds in England, the Centre des Faibles Radioactivites in France, and the Scripps Institution of Oceanography in San Diego. In September 2015, Dr. Love was a Visiting Professor at the University of Paris.

Dr. Love’s research encompasses a wide range of topics within geomagnetism, including dynamo theory, paleomagnetism, magnetic storms, magnetic climatology, and the storm-time induction of geoelectric fields in the Earth’s conducting interior. He has published 78 papers, 52 as lead author.

Dr. Robert P. McCoy

Geophysical Institute, University of Alaska Fairbanks

Space Weather Effects on Navigation & Communication Systems

The Earth's ionosphere, that partially ionized region from 90 km through 2000 km, exerts a variety of effects on radio frequency (RF) signals propagating into or through this region. For lower frequencies (< 20 MHz) the ionosphere can cause total reflection of upward propagating signals allowing long-range communication (HF) and over-the-horizon radar. At higher frequencies (20 MHz – 10,000 MHz) RF signals can penetrate the ionosphere but always undergo a variety of effects such as refraction, time and phase delay, dispersion, fades, and Faraday rotation. When the ionosphere is quiet these effects are minor, but the ionosphere is strongly controlled by solar and geomagnetic effects. Frequently, "ionosphere weather" can lead to major impacts for systems depending on trans-ionospheric propagation like satellite communication and GPS navigation. A disturbed ionosphere often makes satellite communication impossible and increases GPS navigation errors, and sometimes, can lead to GPS navigation outages. Even for quiet solar and geomagnetic conditions the ionospheric electron density can become unstable leading to the creation of "ionospheric bubbles" which cause RF scintillation and outages. Understanding ionospheric scintillation is a complex but high priority problem. Regions of ionospheric scintillation can extend over large areas and can evolve vertically very rapidly. A variety of optical and RF ground based instruments are used to study the physics and climatology of ionospheric variability to gain a better understanding of the triggers of, and dynamics of, ionospheric scintillation. Similarly, sounding rockets and satellites are used to amass data to study ionospheric variability. Detailed studies of ionospheric scintillation can take quite a long time waiting for just the right conditions to trigger this phenomenon. Recent results using a powerful ionosphere heater demonstrate that it may now be possible to flip a switch and create overhead ionospheric scintillation to gain new insights into this important phenomenon.

BIOGRAPHY

Since 2011, Bob McCoy has been the Director of the Geophysical Institute (GI) at the University of Alaska Fairbanks. There he manages ~400 scientists, staff and students who perform research in disciplines including: volcanology; seismology, snow, ice and permafrost; tectonics and sedimentation; remote sensing; atmospheric science; and space physics and aeronomy. The GI is home to the Alaska Volcano Observatory, Alaska Earthquake Center, Alaska Satellite Facility; Alaska Center for Unmanned Aircraft System Integration; and the Poker Flat Research (sounding rocket) Range.

Prior to coming to Alaska he worked as a space scientist at the Naval Research Laboratory (NRL) and a program officer at the Office Naval Research (ONR). At NRL he was principal investigator for 23 sounding rocket, satellite and International Space Station experiments to study the upper atmosphere and ionosphere. At ONR he managed the Navy's space research program and the Tactical Space Innovative Naval Prototype program and he sponsored more than 20 space experiments.

He helped create and chairs the Space Weather Science and Technology Activities Commission (STAC) Committee for the American Meteorological Society (AMS). He is a Fellow of the AMS and he was awarded the Rotary International Stellar Prize for Space Achievement and the NRL 75th Anniversary Innovator Award. He is the Chairman of the Board of Directors for the Alaska Aerospace Corporation.

Moderator

Matthew J. Heavner

Assistant Director, Nuclear and Space Security

Office of Science and Technology Policy

Executive Office of the President

Matthew J. Heavner joined the Office of Science and Technology Policy in September, 2014. Dr. Heavner serves in the National Security and International Affairs Division of the Office of Science and Technology Policy. As Assistant Director for Nuclear and Space Security, Dr. Heavner is focused on a range of nuclear issues ranging from strategic deterrence capabilities to non-proliferation, counter-proliferation, and early detection of nuclear proliferation, as well as the health and sufficiency of the nuclear security enterprise. Dr. Heavner contributes to issues related to space in both civilian earth observations and national security space activities. In collaboration with the National Security Council, Dr. Heavner co-chairs several White House restricted Interagency Policy Coordination committees and subcommittees. Dr. Heavner chairs multiple subcommittees of the Committee on Homeland and National Security of the National Science and Technology Council.

Dr. Heavner previously served on the technical staff at Los Alamos National Laboratory as the Project Lead for the On-orbit United States Nuclear Detonation Detection System (USNDS) Radio Frequency (RF) sensors on the Global Positioning Satellite (GPS) constellation. In this role, Dr. Heavner supported mission capability assurance, on-orbit operations, state of health monitoring, and anomaly resolution by providing subject matter expertise from Los Alamos National Laboratory to the United States Air Force in collaboration with Sandia National Laboratories. Expertise in lightning discharge physics, ionospheric propagation, digital signal processing, satellite constellation performance, system requirements, and nuclear weapons source phenomenology are required to provide this national capability. At Los Alamos National Lab, Dr. Heavner also supported several technology demonstration and validation satellite missions. Dr. Heavner was a tenured Professor of Physics at the University of Alaska Southeast with diverse geophysical interests including space physics, subglacial hydrology, distributed sensors web monitoring of partially glaciated watersheds, satellite remote sensing, and optical spectroscopic measurements of middle atmosphere lightning. Dr. Heavner earned his PhD in Physics from the University of Alaska Fairbanks and his bachelor degrees in Physics, Mathematics, and Philosophy from Southwestern University in Georgetown, Texas

Mr. Steven W. Clarke

Director, Heliophysics Division

Science Mission Directorate, NASA Headquarters

At the center of our solar system there is a magnetic variable star, our sun, that affects the planets, including the Earth, and sculptures the flows of interplanetary space itself. Heliophysics is the study of the sun's influence throughout the solar system and, in particular, its connection to the Earth and the Earth's extended space environment. Data from Heliophysics science missions are vital to the nation's space weather infrastructure. Specific to space weather, NASA formulates and implements a national research program for understanding the Sun and its interactions with the Earth and the Solar System and how these phenomena impact life and society. This program utilizes a fleet of space-based observing systems collectively called the Heliophysics System Observatory.

BIOGRAPHY

Steven W. Clarke was named Director of the Heliophysics Division in the Science Mission Directorate at NASA starting June 1, 2015. Previously, he was the Director of the Joint Agency Satellite Division (JASD). In that role, he was responsible for managing reimbursable satellite and instrument development activities performed by NASA for partner agencies. The division's portfolio includes the Joint Polar Satellite System (JPSS), Geostationary Operational Environmental Satellite (GOES)-R series, Deep Space Climate Observatory (DSCOVR), Jason-3, MetOp/POES, and Solar Irradiance, Data and Rescue (SIDAR).

Steve supported the Deputy Associate Administrator of the Exploration Systems Development (ESD) Division at NASA Headquarters where he was responsible for developing and operating the exploration architecture for human exploration beyond Earth orbit.

After several years as a systems and project engineer in the aerospace industry, Steve joined NASA in 2000 as an integration engineer responsible for NASA's scientific robotic missions. In 2003, he was selected as the Mechanical Branch Chief in the Launch Services Program, Kennedy Space Center, Fla.

He joined the Constellation Ground Operations Project Office when it was established in 2005, assigned as the Chief of the Launch Vehicle Division. Steve was responsible for developing launch vehicle ground processing interface requirements and instilling operability into the launch vehicle design. In 2009, he was selected as the Deputy Director of the Ground Operations Project Office.

Steve has received NASA's Exceptional Achievement Medal for his outstanding leadership in the development of the Ares I launch vehicle in addition to numerous group achievement and performance awards.

Mr. Ralph O. Stoffler

United States Air Force, Director of Weather

The U.S. Air Force provides operational space weather support to all elements of the DoD. The 557th Weather Wing's Space Weather Operations Center and U.S. Strategic Command's Joint Space Operations Center carry out this responsibility through 24/7 space operations centers that incorporate space weather observations from various DoD, U.S. Government, and community sources to supply tailored products to warfighters and other users around the globe. These products are a synergistic combination of ground and space-based sensor data and space and terrestrial environmental models, enabling informed decision-making by operational commanders. The Air Force's Director of Weather will provide an update on the current laydown of the Air Force's ground and space-based space observing network, and he will discuss the Air Force's plans to maintain and expand these capabilities. He will highlight the key Air Force space operations centers providing collection, analysis, forecasting, and application capabilities, while providing insight into the DoD perspective on space weather observing and importance to the global mission set. Finally, the Director of Weather will review examples of the sensor-to-operator chain of events, detailing the transformation of observation to tailored space weather product, and how the products can help mitigate space weather impacts to DoD missions.

BIOGRAPHY

Mr. Ralph O. Stoffler, a member of the Senior Executive Service, is Director of Weather, Directorate of Weather, Deputy Chief of Staff, Operations, Headquarters, U.S. Air Force, Washington, D.C. Mr. Stoffler is responsible for developing and implementing weather doctrine, policies, plans, programs, and standards. He plans and programs for Air Force Weather resources and monitors the execution of the weather program totaling $350 million per year. Mr. Stoffler manages the 4,412-person weather career field, and he interfaces with Air Force Major Commands and the U.S. Army regarding full exploitation of Air Force weather resources and technology. Additionally, he directs interagency activities with the Department of Commerce, the National Aeronautics and Space Administration, and the Federal Aviation Administration.

Mr. Stoffler retired from the Air Force as a Colonel after 30 years of service. While on active duty, he commanded a weather squadron and served as the Deputy Director of Weather among numerous other operational, staff, and training positions. Prior to assuming his current position, Mr. Stoffler was the Technical Director and Acting Director of Weather for the Directorate of Weather at Headquarters, U.S. Air Force. Mr. Stoffler holds a Bachelor of Science degree in Meteorology from the University of Oklahoma and a Master of Science degree in Systems Management from the University of Southern California.

Session 6: Space Weather Observing Systems

Dr. Vladimir Papitashvili

National Science Foundation (NSF)

Recent formulation of the National Space Weather Strategy and respective U.S. Government Agencies "Action Plan" are fundamental step towards better understanding of space weather phenomena and their impacts to human technologies and life. In the "space era", the humanity must constantly observe "space weather" conditions at the Sun, and then monitor Sun's coronal mass ejections and volatile solar wind propagation through interplanetary space to near-Earth environment. This Geospace domain consist of the solar wind interaction region with the magnetosphere, magnetosphere-ionosphere coupling and its effects on the upper atmosphere, and then down to the lower atmosphere. Thus, all spectrum of plasma and field observations are needed across the Geospace domain, which include spacecraft and satellite at critical locations (e.g., L1 and geostationary orbit), as well as ground-based observing systems. The latter should cover ionospheric convection and currents in the polar regions (to where the entire magnetopause is projected) and adjacent mid-latitude regions where "space weather" affect pipelines, electrical transmission grids, and communication links.

BIOGRAPHY

Vladimir Papitashvili is the Program Director for Antarctic Astrophysics and Geospace Sciences at NSF. He works closely with the Atmospheric and Geospace Sciences Division, co-funding research in space weather science and applications, including space weather observing systems such as the SuperDARN radars deployed in the Northern and Southern polar regions, as well as the Iridium satellite-based system AMPERE that provides near-real time snapshots of the field-aligned current distributions over the polar regions.

Before joining NSF, he was an active researcher of the high-latitude geomagnetic disturbances, ionospheric convection, and current system, developing respective data-based models to understand the science of space weather. His major fields of specialization cover space, magnetospheric, and ionospheric physics, solar-terrestrial relationships and solar wind-magnetosphere-ionosphere interaction and coupling, magnetospheric and ionospheric electrodynamics and three-dimensional current systems, geomagnetic field coordinates, numerical simulations, and modeling. He authored and co-authored over 150 refereed and professional publications, as well as presented numerous invited and contributed talks at professional scientific meetings and conferences.

John Pereria

Deputy Director, NOAA/NESDIS/Office of Projects, Planning, and Analysis

NOAA-NESDIS Space Weather Observing Systems

The successful launch and Lagrange Point 1 (L1) orbit positioning of NOAA's Deep Space Climate Observatory (DSCOVR) satellite represents the Nation's first operational space weather satellite in deep space along with the initial wave of many upcoming NOAA space weather observing system contributions. The DSCOVR Mission is a joint NOAA, NASA and DoD space weather program which will succeed NASA's Advanced Composition Explorer's (ACE) Mission in providing solar wind measurements from the L1 orbit. The satellite successfully reached its L1 destination on 07 June 2015, and is currently proceeding with instrument and spacecraft commissioning activities. The transition over to NOAA operations is planned to occur in October 2015.

Current NOAA space weather instrument containing satellite development efforts include the GOES-R series and COSMIC-2. We are also engaged in planning for a mission to follow DSCOVR to include a coronagraph. GOES-R is scheduled to launch its first satellite in CY2016 and will contain an X-ray Irradiance Sensor, Magnetometer, Space Environmental in-situ Suite and a Solar Ultra Violet Imager. COSMIC-2 is planning to launch its first constellation of satellites in September 2016, and will be contributing an Ion Velocity Meter and a RF Beacon Transmitter. NOAA will continue to pursue collaborations with NASA for advanced sensor and propulsion technologies for the improvement of space weather services. Finally, we will be responding over the next several years to actions from the SWORM activities.

BIOGRAPHY

John Pereira serves as Deputy Director of the NESDIS Office of Projects, Planning, and Analysis (OPPA) and Chief of the OPPA Research to Operations and Project Planning Division (ROPPD). In support of the OPPA Director, Pereira oversees the development, acquisition, integration, installation, and acceptance of major system elements (spacecraft, instruments, launch services and ground systems) for NOAA operational environmental satellite systems. As ROPPD Chief, Pereira is responsible for conducting pre-formulation studies and other investigations to determine how NOAA can better meet and sustain its needs for satellite observations of the atmosphere, oceans, land, and space environment. ROPPD works with internal and external partners to translate NOAA user requirements into future enhancements or changes to NOAA satellite programs.

Mr. Pereira has served in multiple assignments at NOAA since 1992. In 2012-13, he managed a contractor-led independent study to identify ways in which NOAA might mitigate a gap in critical sounder data from the NOAA afternoon polar-orbiting operational satellite. Many of the recommendations from the study were later funded for implementation as part of the Hurricane Sandy / Disaster Relief Act. Since 2010, he has led an annual conference on the transition of research to operations at the annual meeting of the American Meteorological Society. In 2007 he led an Analysis of Alternatives assessment of geostationary sounding and ocean color capabilities in the wake of the cancelled Hyperspectral Environmental Suite on GOES-R. In 1998 he led the development of a NOAA ground system to ingest, process, and deliver EUMETSAT's Meteosat-5 imagery products to U.S. Government users.

Prior to his career in NOAA, Mr. Pereira served as a weather officer in the U.S. Air Force. His last assignment, prior to joining NOAA, was the Air Force weather liaison officer to NESDIS and National Weather Service. He earned an M.S. in meteorology from the U.S. Naval Postgraduate School and a B.S. in meteorology from the Pennsylvania State University.

Mr. Michael Bonadonna

Senior Staff Meteorologist

Office of the Federal Coordinator For Meteorology

Mr. Bonadonna is currently the Secretariat for the Federal Meteorological Coordination and Executive Secretary of the National Space Weather Program. He has served as Acting Deputy Federal Coordinator manages over 30 committees, working groups and projects at the Office of the Federal Coordinator for Meteorology (OFCM).

He has over 30 years of proven experience in the fields of meteorology, atmospheric and space physics, solar-terrestrial interactions, space-based force application, C4ISR, air and space operations center activities, international relations, U.S. government interagency processes, and environmental effects on systems and operations. Mr. Bonadonna has solid academic foundation in physics, meteorology, and the space environment with a sharp understanding of political, military, and foreign affairs subjects. He is a proven people-focused and results-orientated leader having earned real-world operational experience in Europe, Asia, and the Middle-East. Mr. Bonadonna is an expert in joint and international military operations with top-notch training. He is knowledgeable and experienced in system acquisition, funding, fielding, and logistics. He places a priority on building partnerships to meet mission needs previously unattainable.

In his 24-year U.S. Air Force career he earned the Defense Meritorious Service Medal, Joint Service Commendation Medal, Air Force and Army Commendation Medals. He is a graduate of the George Washington University, Penn State University, Air War College, and the University of Lowell with advance degrees in Meteorology and Business Administration.

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