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THE NATIONAL SPACE WEATHER PROGRAM

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ABSTRACT

The inexorable climb in solar activity of the new Cycle 24 is about to begin, with the next Solar Maximum coming in 2011 to 2012. Since the last maximum in 2000, society has become more dependent on GPS and satellites for myriad applications, and trans-polar flights are on a steady increase, raising the potential for hazardous radiation exposure for passengers and crews. The National Space Weather Program (NSWP) is a federal government initiative within the coordinating infrastructure of the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM). The goal of the NSWP is to speed improvement of space weather products and services through research, transition of research to operations, and improvements in operational capability to better prepare the U.S. for the effects of space weather on technological systems, activities, and human health. The National Space Weather Program Council, through its Committee for Space Weather (CSW), continues to address the recommendations of the OFCM-sponsored Independent Assessment Committee for the NSWP published in 2006, including preparation of a new Strategic Plan and Implementation Plan. In addition, the CSW prepared a disaster reduction implementation plan as part of the National Science and Technology Council Subcommittee on Disaster Reduction portfolio of grand challenges in disaster reduction. The OFCM and the CSW continue to facilitate conferences, symposia, and similar activities to advance the program and raise awareness of space weather effects on our society.

1. INTRODUCTION

The National Space Weather Program (NSWP) is a U.S. federal government interagency program established in 1995 to coordinate, collaborate, and leverage capabilities across the stake holding federal agencies, including space weather researchers, service providers, users, policy makers, and funding agencies to improve the performance of the space weather enterprise in support of the nation. This paper provides a brief review of the history of the program, and an update on the NSWP and its recent activities, including education and outreach through various forums, developing new strategic and implementation plans, and assessing critical interagency issues. Today, space weather reaches ever further into an increasingly technology-based society, with impacts on safety, security, and the economy reaching potentially into the billions of dollars. As the current Solar Minimum ends and Cycle 24 begins, recent solar events are reminders not only of negative space weather effects on communications, navigation, spacecraft operations, and human health, but the opportunities available to improve products and services to benefit society.

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2. BACKGROUND

The Office of the Federal Coordinator for Meteorological Services and Supporting Research, more briefly known as the Office of the Federal Coordinator for Meteorology (OFCM), is an interdepartmental office established because Congress and the Executive Office of the President recognized the importance of full coordination of federal meteorological activities. The Department of Commerce formed the OFCM in 1964 in response to Public Law 87-843 and established the interagency coordinating infrastructure which continues in updated form today.

In the early to mid-1990s, the emerging space weather community came together to establish a coordinated federal effort, creating the interagency National Space Weather Program under the auspices of the OFCM. To guide the program, the OFCM established the National Space Weather Program Council within the federal meteorological coordinating infrastructure. In 1995, the Council approved and the OFCM published the NSWP Strategic Plan (OFCM 1995). The plan documented goals to improve observing, analysis, and forecasting of space weather, necessarily with a foundation of improved fundamental understanding of the physical processes. The plan also sought to advance the transition of research into operations, improve forecast accuracy and reliability, and develop new products and services aimed at user needs. Another goal was education and outreach to communicate to a widening circle of users the definition of space weather, its effects, and how to mitigate those effects.

In 1997, the OFCM published the first National Space Weather Program Implementation Plan (OFCM 1997) and followed with the Second Edition in 2000 (OFCM 2000). The implementation plan provided a synopsis of current capabilities and defined more

specific direction for the community to pursue to achieve program goals. It described from both the operational and research perspectives various spacecraft, sensors, observational capabilities, specification and forecast models, and basic metrics against which to measure progress. Finally, it defined program management through the Program Council and the Committee for Space Weather, laid out federal agency roles and responsibilities and described the roles and contributions of other critical players such as the international space weather community. The Second Edition also formally incorporated into the program the detailed analysis and planning done by the National Security Space Architect during that same period.

Today, the Council continues to provide policy and guidance for the NSWP, coordinate agency roles and activities, and oversee the preparation of plans, strategies, and operational concepts.

Under the Council, the Committee for Space Weather and the newly established Committee for Space Environmental Sensor Mitigation Options, with their working and action groups provide: (1) a forum for each agency to report activities, difficulties, and achievements; (2) a mechanism for coordinated change and problem solving; (3) a medium for collection, documentation and consolidation of agency requirements and inventories; (4) oversight for coordinated system development; (5) a vehicle for coordinating with other groups; and (6) a mechanism for the preparation of studies, agreements, standards, protocols, reports, and national plans.

3. ACTIVITIES

3.1 Space Weather Enterprise Forum

In 2007, the National Oceanic and Atmospheric Administration's Space Weather Prediction Center conducted the first Space Weather Enterprise Forum as a Washington, DC-based extension of their long-running annual Space Weather Workshop in Boulder, CO. This annual forum helps bring policy maker attention to the growing space weather needs of a technological world. Stakeholders from across the enterprise gather to discuss concerns, capabilities and hazards, highlight the need for research and services today and into the future, and extend outreach efforts to an expanding user community.

Following the 2008 forum, the NSWP Council agreed to take a leading role in organizing future events to broaden interagency involvement. The 2009 forum will be in May in downtown Washington, DC, to address economic, societal, and national security impacts of space weather, with a focus on improving strategic cooperation, expanding education and outreach, and more clearly defining needs and requirements. The results of the 2009 forum will also inform the ongoing development of a new strategic vision and goals for the NSWP as described in the next section.

3.2 NSWP Strategic and Implementation Plans

In 2008, the Committee for Space Weather continued to develop a new strategic vision, goals, and a new NSWP strategic plan to set the course of the program for the next 10 years. The new plan also addresses the recommendations from the 2006 independent assessment of the NSWP (OFCM 2006).

The Committee plans to finalize this new Strategic Plan by the summer of 2009 and then begin development of a new Implementation Plan to move the enterprise forward under this new vision and new goals.

3.3 Space Weather Grand Challenges for Disaster Reduction

Another NSWP project was the development of a space weather implementation plan for the Subcommittee for Disaster Reduction under the White House National Science and Technology Council's Committee on Environment and Natural Resources. The Subcommittee identified 15 disaster hazards, including space weather, on which to focus the Grand Challenges for Disaster Reduction. The grand challenges are: (1) providing hazard and disaster information where and when needed; (2) understanding the processes that produce hazards; (3) developing mitigation strategies and technologies; (4) recognizing and reducing vulnerability; (5) assessing resilience; and (6) promoting risk-wise behavior. The objective is a ten-year strategy to enhance the Nation's resiliency in the face of these 15 different hazards. (SDR 2005)

The Committee for Space Weather submitted its disaster reduction Space Weather Implementation Plan to the SDR in early 2008. The plan is in final coordination to be published in early 2009.

3.4 Committee for Space Environmental Sensor Mitigation Options

In June of 2007, the White House Office of Science and Technology Policy (OSTP) asked the OFCM to lead an interagency assessment of the impacts on both operations and research of the reduced space environmental sensor capability now planned for the National Polar-orbiting Operational Environmental Satellite System (NPOESS). Extensive sensing capability had been removed from NPOESS to reduce program costs following a Nunn-McCurdy review and certification of NPOESS precipitated by major cost increases. The OSTP also asked for a review of both operations and research uses of solar wind data from the Advanced Composition Explorer (ACE) spacecraft at the L1 libration point about one million miles toward the Sun along the Sun-Earth line. A portion of the assessment examined the impacts of losing continuity of this solar wind data.

The OFCM formed a Joint Action Group under the auspices of the NSWP and the Committee for Space Weather to perform this assessment and subsequently submitted its report to the OSTP in January 2008. The report identified five significant impacts on national infrastructure and activities, including satellite operations, GPS navigation, and global satellite communications. (OFCM 2008)

Based on results of the assessment, the OSTP subsequently asked the NSWP Council at its August 2008 meeting to support an OFCM-led interagency study to assess space environmental sensor mitigation options. This study addresses the requirements now left unmet by the NPOESS program as well as options to ensure continuity of critical solar wind monitoring capabilities currently provided by the ACE spacecraft.

In December 2008, the OFCM established a new Committee under the NSWP Council to lead this study. The interagency Committee for Space Environmental Sensor Mitigation Options (CSESMO) is chaired by senior leaders from Air Force Space Command and NOAA's National Environmental Satellite, Data, and Information Service. The study plan calls for broad interagency involvement culminating in written summaries and briefings to the OSTP planned for the summer and fall of 2009.

4. SUMMARY

Over the past 13 years, the NSWP has facilitated a coordinated, cooperative, and collaborative approach to identify and use relevant research, focus new research, transition research results into operations, improve space weather products and services, and educate a diverse and rapidly growing user community. In the last year, the program has assessed impacts of reduced sensor capability in low Earth orbit and potential loss of solar wind data from the ACE spacecraft, supported the Space Weather Enterprise Forum to expand outreach and raise awareness of space weather, crafted the disaster reduction implementation plan, and continued to address recommendations from the 2006 independent assessment. In 2009, the program will organize another Enterprise Forum, finalize a new Strategic Plan, and complete a study of space environmental sensing mitigation options to address shortfalls in meeting low Earth orbit requirements and maintaining continuity of solar wind data from the L1 libration point. Throughout the year, the NSWP will continue to address improvements in products and services and foster the transition of research results into operational capability to better meet today's societal demands and tomorrow's emerging needs.

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