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Space Weather Community Operations Workshop: Planning for the Next Decade

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Scenario: Japan suffers a great earthquake, a major tsunami, and a catastrophic nuclear meltdown. Telecommunications landlines and cell phone towers are inoperable in northern prefectures. This means that high-frequency (HF) radio becomes the primary means of communication to some affected areas. This also means that 3-hour forecasts of HF availability must be provided by space weather service organizations not affected by the disaster (Figure 1). Questions: How accurate are the HF predictions? How reliable is the service? How available is the information?

In the wake of a disaster, scenarios and questions of this sort face operational space weather providers and product end users throughout the supply chain, from raw space environment data to tailored communications products. To begin answering these questions, space weather operations organizations, from various commercial, academic, and government spheres, recently held their first Space Weather Community Operations Workshop, 1–2 February 2011, in Logan, Utah.

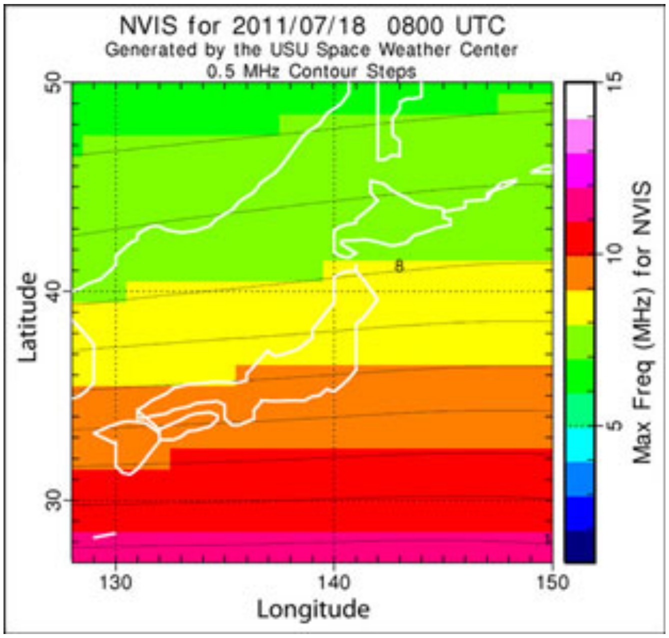

Figure 1. Near-vertical incidence sky wave (NVIS) propagation frequencies over Japan. This image displays an example of best frequencies to use over a relatively short distance using this common propagation technique.

The workshop, hosted by the Space Weather Center (SWC) at Utah State University (USU), had an objective of building on distributed space weather networks that already exist. W. Kent Tobiska, SWC director, introduced this objective by pointing to the operations level information exchange already occurring between six organizations: NOAA Space Weather Prediction Center (SWPC); NASA Community Coordinated Modeling Center (CCMC); University of Colorado at Boulder Laboratory for Atmospheric and Space Physics (LASP); Space Environment Corporation (SEC), based in Providence, Utah; Space Environment Technologies (SET), based in Pacific Palisades, Calif.; and SWC. The workshop's informal format encouraged discussion on lessons learned in space weather studies; institutional space weather operations activities, requirements, successes, and future directions; and community standards.

The workshop participants described each organization's data sets, specialties in space weather data collection and maintenance, and concerns about protecting data. Speakers from each organization addressed two key questions: How can others access and use their data more effectively, and what are the main obstacles to using their data?

Participants discussed how to determine best practices for space weather operations. They also considered whether there is a need for common operations requirements and practices as well as data exchange interfaces.

Discussion topics included how mission assurance qualities can be achieved, including safety, reliability, quality, maintenance, monitoring, verification (the process of ensuring that a product or process, as constituted, complies with the requirements specified for it), and validation (the act of determining that a product or process, as constituted, will fulfill its desired purpose). Some participants wanted to know if there is a way to improve data exchange and space weather operations by strengthening interagency, academic, cross-sector, and international collaborations.

For example, providing a quality space weather product that is accurate and reliable is of key importance. Visually, a product must be simple to understand. Representation of conditions must be accurate. Easily accessible information in sufficient detail to make decisions, low latency and appropriately rapid updates, and an unambiguous guide to action—now and for any given time in the future—must become commonplace.

The workshop took an initial step in defining best practices for space weather operations; it is hoped that in the future, best practices will move toward a set of community standards. Improving common space weather operations by collaboration, fluid data exchange, automated monitoring, and anomaly resolution allows for validation and verification.

A recommendation from the workshop was to review the Space Weather Operations Mission Assurance Standard (MAS) recently commissioned by SET from the American Institute of Aeronautics and Astronautics (AIAA) Technical Committee on Mission Assurance. The documents (available at http://www.spacewx.com/ under the "standards" link) include recommended practices. Other recommendations focused on preferred tools, especially preferred operating systems, shells, programing languages, file formats, and naming and security conventions, all of which can ensure the space weather operations mission in the future.

The motivation behind all of this is to help generate an ideal future scenario: A natural disaster wipes out telecommunications in a given area of the world, but because of space weather community relations, services needed to help those affected have become more effective, more reliable, and more broadly available. This workshop concluded with action items for improving common space weather operations, just as would be necessary in this scenario. The success of this first Space Weather Community Operations Workshop has led to plans for a follow-up workshop next year for continued collaboration on standards and discussion of lessons learned throughout the past year. The aim now is to draw more space weather professionals from wide-ranging groups, such as the National Geophysical Data Center, the Air Force Weather Agency, and international partnerships to further develop these relationships and technologies.

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