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The Second Annual Space Weather Community Operations Workshop: Advancing Operations Into the Next Decade

Jennifer Meehan, Jared Fulgham, and W. Kent Tobiska

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How can we continue to advance the space weather operational community from lessons already learned when it comes to data reliability, maintainability, accessibility, dependability, safety, and quality? How can we make space weather more easily accessible to each other and outside users? Representatives from operational, commercial, academic, and government organizations weighed in on these important questions at the second annual Space Weather Community Operations Workshop, held 22–23 March 2012 in Park City, Utah, with the unofficial workshop motto being Don't Reinvent the Wheel.

The workshop, hosted by the Space Weather Center (SWC) at Utah State University (USU), had an objective of building on preexisting distributed space weather networks. W. Kent Tobiska, director of USU SWC, introduced this objective by pointing to the operations-level information exchange already occurring between 11 organizations: NOAA Space Weather Prediction Center (SWPC); NASA Community Coordinated Modeling Center; Laboratory for Atmospheric and Space Physics; Atmospheric and Environmental Research; Center for Space Plasma and Aeronomic Research; Exploration Physics International; Rice Space Institute; U.S. Geological Survey (USGS); Space Environment Center; Space Environment Technologies; and the event host, USU SWC.

The workshop brought together two dozen core commercial, agency, and university space weather operational personnel to promote a robust data exchange capacity within the space weather enterprise. This data exchange focuses on sharing common operational problems and solutions as well as working toward developing best practices that will eventually become standards for space weather operations.

Each participant discussed mission assurance best practices in terms of reliability, maintainability, accessibility, dependability, safety, and quality. For example, recommendations for reliability best practices would be to maintain redundancy by creating several channels for data access making systems more reliable by allowing data customers multiple access points and relieving strain on systems. Unreliable source

data are detrimental to space weather products when downstream users are unable to ingest data.

Looking at maintainability, simple practices such as consistent, intuitive file-naming conventions; maintainable software; documentation (e.g., user guides and test plans); and attention to other best practices in software development are vital. Structural and descriptive metadata are key players in accessibility. Following the simple outline of Who, What, Where, When, Why, How, and Whose is recommended for creating and developing meaningful metadata that will benefit the end user. Dependability of data and systems becomes a main focus for data producers and maintainers. The direct access servers (non-Web) such as the External Space Weather Data Store used by NOAA SWPC and Earthworm used by USGS are examples of different systems used to bolster dependability of data access for users.

Finally, safety and quality of products and data can be tested against several different challenges, including Geospace Environment Modeling (GEM) Metrics, Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) Electrodynamics Thermosphere Ionosphere (ETI), GEM-CEDAR (*Dst*), and Solar Heliosphere and Interplanetary Environment (SHINE) program (see <http://ccmc.gsfc.nasa.gov/support/CETI2010/>). Quality products will help improve the safety of the same products, fostering a community perception of trustworthy space weather data providers.

Topics of coronal mass ejection forecasts and ensemble modeling, high-latitude energy inputs, and products and services were discussed in breakout sessions. These sessions generated ideas for creating accessible data distribution systems, ensuring reliability in operational data systems, building dependable data networks, establishing and implementing operational space weather best practices, and developing maintainable operational systems.

The 2012 workshop concluded with action items for improving common space weather operations. The success of the first Space Weather Community Operations Workshop in 2011 led to sponsorship of the second workshop by the Amer-

ican Commercial Space Weather Association, American Institute of Aeronautics and Astronautics, American Meteorological Society, and USU SWC. For continued collaboration on standards and discussion of lessons learned throughout the past year, an organizing committee was formed to hold a 2013 workshop with an objective of developing a best practices document. A primary goal in preparation for the 2013 workshop will be to attract more space weather professionals from wide-ranging groups, such as the Air Force Weather Agency and international partnerships, to further develop

these relationships and technologies.

For the full 2012 workshop report, please visit <http://google.com/cppYj>.

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