

Space Weather Council

August 2024 Meeting Report

SWC Meeting: August 8 – 9, 2024

- SWC Council Members present
 - Nicole Duncan (Chair), Alexa Halford, Janet Green, Paul O'Brien, Dan Welling, Dan Baker, Ron Turner, Harlan Spence
 - Not present: Piyush Mehta, Angelos Vourlidas, Michele Cash
- SWC Designated Federal Officer
 - Kelly Korreck
- SWC received 2 updated tasks from HPAC in June 2024 which are addressed in this report, and continues to invite the chairs of the Space Weather Advisory Group and Space Weather Roundtable for updates
 - [space-weather-council-directions.pdf \(nasa.gov\)](#)

Task 1

Space Weather Enterprise Coordination

SWC Scope

- Discuss the HPAC topics with SWORM, SWAG, and Roundtable
- Panelists
 - Tammy Dickinson – SWAG chair
 - Geoff Crowley – Space Weather Roundtable chair
 - Ursula Rick – SWORM (did not present due to time constraints, presentation provided)
 - Matina Gkioulidou - HPAC
- SWC Task 1 Leads
 - Ron Turner & Harlan Spence

TASK 1 Coordination with Other Space Weather Groups

- **Finding:** SWC members value the briefings we receive from the SWORM, SWAG, and SWR during our meetings. We are concerned that notification of documents, presentations, and other products from these groups may not always be reaching the SWC between our meetings and the websites may not be updated with the latest information.
- **Recommendation:** The DFO or other designee should identify a process which informs the SWC of important documents, presentations, and products released by the SWORM, SWAG, and SWR upon their release. This could include links to other groups' websites and notifications to the group.

Tasks 2 & 3

Not requested for discussion at this meeting

Task 4

Interagency

From HPD/HPAC:

- The HPAC request was to:
 - Continue to report on domestic and international partnerships and opportunities to expand coordination. The NASA partnerships and coordination domestically and internationally are important to the success of the Space Weather Program.
- To focus in on how to optimally meet these goals, HPD requests that the HPAC and the Space Weather Council examine the characteristics of an effective model of international collaboration for large scientific intra-governmental projects.
 - Are there specific examples in the science (perhaps particle physics or earthquakes) of effective international collaboration that NASA HPD Space Weather Program should explore?
 - What are the characteristics that make these successful?
 - How were they formed? Was it programmatically from a government agency or from a grassroots effort?
 - What is their funding structure?
 - What types of non-governmental partnerships are also successful?

SWC Scope

- Panelists
 - Kelly Korreck – NASA Introduction to Topic
 - Jussi Luntama – ESA Space Weather Service Network
 - Dave Wilson – Global Seismic Network
- SWC Task 4 Leads
 - Paul O'Brien & Janet Green

Task 4 Agency Coordination, Finding 1

- **Finding:** ESA's Space Safety program briefed the SWC on their distributed, pre-operational, network of space weather services (<https://swe.ssa.esa.int/>). The SWC finds that ESA's program contains elements that can be valuable for NASA's space weather program. Although the network was organically developed without availability requirements, it achieves >95% availability over nearly 30 services, which underscores the success of their approach. Many of the lessons learned from ESA's program are similar to those SWC reported on in the February 2024 meeting's Task 4 Findings 2 & 3.
- **Recommendations:** (next slide)

Task 4 Agency Coordination, Finding 1

- **Recommendations:** NASA's Space Weather Program should consider adopting some of these best practices:
 - Implement a distributed architecture which can be an agile and flexible augmentation to complement the US' centralized approach
 - Expect direct user engagement over the entire project lifecycle, including during formulation of project objectives from user needs
 - Support promising services beyond the initial ~3 year development time - this allows users to become familiar with the services, evaluators to validate truly out of sample, and researchers to demonstrate end-user value/sustainability before transitioning to operations
 - Use ongoing projects to build long-term relationships between researchers and end users (the Council notes that in the US this might provide an opportunity for space weather service providers to develop commercial augmentations of the government-funded capabilities)
 - Provide end-user training including webinars, tailored service campaigns, and meetings to facilitate learning between users/researchers and to broaden end-user engagement across space weather research and applications
 - Remove hurdles to outsourcing and contracting with less traditional entities directly, such as small businesses, HBCUs, tribal colleges and tribal nations, including investigating methods to contract with small businesses more broadly than in Phase 1 & 2 SBIRs.

Task 4 Agency Coordination, Finding 2

- **Finding:** The Global Seismic Network's approach to seismologic monitoring combines instrumentation and data streams from different institutions and funding sources into a unified network that supports both research and operational needs. The network includes data contributions from an operational agency (USGS), NSF funded university research projects, and international partners. The effort is coordinated through a consortium of research focused universities with additional oversight and advisory committees that include government agency members. The collaboration with joint direction has benefited and augmented the network well beyond its individual components. Research has fueled the continued effort and need for operational monitoring and sustained monitoring has enabled new research insights. The partnership has successfully maintained the network for several decades. (<https://www.earthscope.org/>)
- **Recommendations:** (next slide)

Task 4 Agency Coordination, Finding 2

- **Recommendations:**

- NASA should evaluate the impact of creating a multi-purpose observing network that supports both research and operations with a multi-institution advisory structure.
- NASA should consider establishing a research consortium that would coordinate between individual PI led missions and other efforts. A consortium would create a single point of contact for coordination with users, other agencies, and international partners. For simplicity and feasibility, the consortium should initially be focused on a single technical area.
- NASA should embrace long term monitoring and data continuity for the benefit of space weather science that must capture solar cycle changes on timescales of decades

Task 4 Agency Coordination, Finding 3

- **Finding:** NASA conducts a substantial amount of space weather activity across its many centers and programs. Monthly Status Reviews (MSRs) provide a valuable forum for HQ to track such activities across the NASA enterprise. That material is not presently being captured in a report that communicates to the rest of NASA, its partners, and stakeholders the full extent of space weather activities across NASA.
- **Recommendation:** Once a year, NASA should issue a comprehensive report that catalogues and updates the space weather activities across the entire organization. This document can be a compilation of the material being presented in the MSRs.

Task 5

Not requested for discussion at this meeting

Task 6

Space Weather Scales

From HPD/HPAC:

- Currently, a study by the SWORM is underway to:“Refine space weather benchmarks that provide quantitative baselines to assess the intensity of space weather events”
- This includes a study to see if the scales used in space weather should be revised. NASA seeks to understand what areas of space weather scientific research and modeling and observations would be affected by any change. HPD requests that the HPAC and Space Weather Council investigate the following.
 - Where in the Space Weather scientific research are the space weather scales used? How are they used and what impact could a change have on that area?
 - Data archives
 - Longitudinal research
 - Modeling input/outputs
 - Observational data set
 - Other

SWC Scope

- Panelists
 - Kelly Korreck – NASA Introduction to Topic
 - Asha Balakrishnan, STPI – Revision of Space Weather Scales
 - Yihua Zheng, GSFC/CCMC – CCMC and Space Weather Scales
- SWC Task 4 Leads
 - Alexa Halford & Dan Welling

Task 6 (Scales), Finding 1

Finding: NOAA's updated scales effort can yield insights from the user surveys and interviews that may inform NASA's research and applications efforts. However, it is unclear if this information will be made available to NASA and the research community.

Recommendations:

- Discuss with NOAA/STPI how to ensure that user survey and interview information is provided from the scales effort that can inform O2R for NASA, and make this information publicly available to help researchers understand unmet needs.
- When the report is released, engage with the SWC to analyze potential gaps for NASA to consider addressing

Task 6 (Scales), Finding 2

Finding: An update to the NOAA scales will impact a broad array of Space Weather users. Researchers and users may benefit from more communication and information about how to exploit the scales to improve operational decision-making and space weather research. There was discussion that the historical events may not be re-calibrated to the new scales, which may cause issues and confusion about how the new scales compare to past events.

Recommendations: Upon the release of the new scales:

- NASA SWx Program should be prepared to support development/update of demonstration decision aids and products (beyond the environmental forecasts) for users to assess and mitigate likely impacts of space weather based on the new scales.
- NASA should consider how to help with translation between the new and old scales for the benefit to both the scientific and user communities.
- NASA should help relate scales to space weather impacts for the user and research communities.
- NASA should consider how to help researchers validate their results with respect to the new scales employed by the user community.
- NASA should communicate to researchers the relationship between the new scales and observed phenomena, helping to establish a common language between the research and user communities.

Task 6, Finding 3

Finding: Granularity is likely to be a focus of the new or future scales. It is the research community's responsibility to work with the user community to identify and communicate caveats associated with disconnects between the granularity of the scale and how that connects to the physical phenomena and the impacts for the user. (example: county wide forecast tornado warnings when the actual threat is much more localized).

Recommendations:

- NASA may consider working with the research community, operational centers, and users to identify what is needed (observations, models, etc) to ensure the granularity of the scales match the extent of the physical threat. As well as how may additional research observing platforms provide sufficient scientific and operational value leading to more localized warnings, improving actionable information for end uses as well as improved research data coverage and collection for researchers.
- NASA should consider the model used by Earth Scope. - NASA helps provide the plus up to the scale to provide more spatial/temporal/ other value to the monitoring infrastructure.

Cross-cutting - Data accessibility and usability

Finding: There are a multitude of agencies and organizations hosting datasets which have value to the broad space weather community. However, there are challenges accessing and using these datasets across agencies. The SWC identified a need for a clearly defined organizational responsibility to gather, store and make data accessible to the community.

Recommendations: (next slide)

Cross-cutting - Data accessibility and usability

Recommendations:

- NASA should evaluate how space weather data is made available to the community, including efforts and examples such as,
 - the Heliophysics Data Resource Library (HDRL),
 - how other divisions/directorates (Earth Science & NSF OPP) and groups provide and track the progress of data archives,
 - the use of data portals both at NASA and other institutions, and
 - what types of data, both owned and used by research funded through NASA, should be either archived at NASA or provided through NASA data portals.
- NASA should evaluate how to provide data services that include::
 - data curation
 - tracking space weather data sets across agencies,
 - advocating for data release,
 - ensuring ease of data utilization,
 - ensuring AI/ML ready data, and
 - hosting synthetic data.
- NASA should consider tasking SWC to look more deeply into this topic.

Suggested Next Meeting Topics

Submitted to HPAC

Suggested next meeting topics

- Task 3, Human Exploration - The SWC is looking forward to interacting with Dr. Savage in future meetings to discuss human and robotic space weather support in, and beyond, CisLunar space. SWC recommends inviting Dr. Savage to the next SWC to discuss her role and to better understand her perspective on needs & gaps. SWC requests HPD further define topics to discuss in this Task.
- Task 6, Scales - Finding 1, When NOAA's scales report is released, engage with the SWC to identify potential research and application gaps that arose during NOAA's study for NASA to consider addressing
- New Task, Heliophysics Decadal - When NASA determines its response to the Heliophysics decadal, the SWC would welcome a conversation about the agency's response and rollout-plans for space weather.

Suggested next meeting topics

- New Task, Space Weather Communications Strategy - what are the elements that HQ should consider in their Space Weather Communications Strategy? What do researchers need in order to improve their communications with user groups and the public? Such as communicating with multiple audiences/stakeholders, incorporating best practices from social sciences, providing support to build visual aides, etc.
- New Task, STMD technical gap analysis - Invite space weather technical experts to review STMD's technical gap analysis and report if there are key technical gaps missing from the list that could be addressed by STMD. The invited speakers could use the previous observational gap analyses, or the Decadal, to inform their analysis. HPD could use this community input to inform discussions with STMD.
- New Task, Data accessibility and usability - in addition to the finding and recommendations in this report, NASA should consider tasking SWC to look more deeply into this topic.