

Heliophysics Advisory Committee Report



Report to the NASA HQ Heliophysics Division
From the November 14-16, 2023, HPAC Meeting

SUMMARY OF THE 14-16 NOVEMBER, 2023, HPAC MEETING

We convened a hybrid meeting on Tues.-Thurs., 14-16 November, 2023.

- All HPAC members were present for all or part of the meeting (see slide 4 for membership list)
- The Designated Federal Officer (DFO) was Janet Kozyra, NASA-HPD

Presentations to HPAC on November 14:

- HPAC Charter and Operating Procedures, Janet Kozyra
- HPD Division Update, Peg Luce
- Space Weather Council and Space Weather Action Group summary, Nicole Duncan
- Space Weather Program Update, James Favors and Genene Fisher
- R&A Update, Patrick Koehn
- Solar Max/Heliophysics Big Year, Janet Kozyra

SUMMARY OF THE 14-16 NOVEMBER, 2023, HPAC MEETING

Presentations to HPAC on November 15:

- IDEA, Kelly Korreck
- Heliophysics Big Year – Solar Eclipse, Kelly Korreck
- Heliophysics Strategic Technology Office (HESTO), Roshanak Hakimzadeh
- Heliophysics Digital Resource Library, Matt McClure

We thank all of the speakers for their time and effort preparing material for this meeting

We welcome any requests from NASA Heliophysics Division for clarification or elaboration on our findings and recommendations

HPAC MEMBERS

- Aroh Barjatya (Embry-Riddle Aeronautical University), remote
- Dave Brain (University of Colorado, Boulder), remote
- Paul Cassak (West Virginia University), Chair
- Nicole Duncan (Ball Aerospace), remote
- Christoph Englert (U.S. Naval Research Laboratory), Vice Chair
- Matina Gkioulidou (Johns Hopkins University Applied Physics Laboratory)
- Farzad Kamalabadi (University of Illinois, Urbana-Champaign)
- Laura Peticolas (Sonoma State University), partially remote
- Chadi Salem (University of California, Berkeley), remote
- Barbara Thompson (NASA Goddard Space Flight Center), partially remote
- Lisa Upton (Southwest Research Institute), remote
- Marco Velli (University of California, Los Angeles), remote
- Jia Yue (Catholic University), partially remote
- Eric Zirnstein (Princeton University)

SUMMARY OF FINDINGS AND RECOMMENDATIONS

- Findings on Heliophysics Division activities
- Finding and Recommendation about GDC and DYNAMIC
- Finding and Recommendations about HSO infrastructure missions
- Finding and Recommendation about R&A funding level
- Findings and Recommendations regarding Space Weather Council (SWC) activities
- Finding and Recommendation about R2O2R
- Finding and Recommendation about reporting proposal success rates
- Finding and Recommendation about dual anonymous peer review
- Finding and Recommendation about HPD IDEA activities
- Findings and Recommendations about the Heliophysics Big Year
- Finding and Recommendation about HESTO
- Finding and Recommendations about Heliophysics Digital Resource Library

FINDINGS ON HELIOPHYSICS DIVISION ACTIVITIES

Findings:

We commend HPD for a number of successes since the last HPAC meeting:

- The successful launch of Atmospheric Waves Experiment (AWE)
- Robust plans for upcoming mission launches
- Support of new Space Weather Centers and DRIVE Centers
- Implementation of new programs that fill interdisciplinary gaps in the research and analysis portfolio
- Thoughtful efforts supporting the advancement of IDEA at NASA HPD
- Successful outreach associated with the recent annular eclipse
- Launching the HELiophysics Strategic Technology Office (HESTO)
- SMD-leading efforts on open data

We also convey our gratitude to Peg and Therese for their acting leadership roles at HPD in a time of community need, and to Janet and the entire HPD team for their efforts in organizing the HPAC meeting

FINDING AND RECOMMENDATION ABOUT GDC AND DYNAMIC

Finding

- We commend HPD for its effort to continue implementing GDC and DYNAMIC despite all the difficulties. All instruments of GDC have been selected. One or more DYNAMIC Phase A proposals will be selected. HPD recognizes that the science goals of GDC and DYNAMIC complement each other. However, HPAC is disappointed that GDC is paused and delayed due to HPD funding constraints. GDC is the only unaddressed mission concept from the 2013 Decadal Survey. DYNAMIC is also recommended and unresolved. Both missions offer incredible opportunities to nurture the field and a whole new generation of instrument scientists. Improved understanding of ionosphere and thermosphere physics enabled by GDC/DYNAMIC is essential for space weather applications.

Recommendation

- We recommend HPD explores all options for ensuring that GDC and DYNAMIC science is pursued with high priority in the given budget reality.

FINDING AND RECOMMENDATIONS ABOUT HSO INFRASTRUCTURE MISSIONS (1 of 2)

Finding

- In the last Senior Review, NASA transitioned six Heliophysics missions to Heliophysics System Observatory (HSO) Infrastructure. HPAC recognizes that this is a reasonable way to allow missions to keep operating and produce data useful to the community within a limited budget.

Recommendations

- In the Heliophysics Senior Review Call for proposals it is stated that “*HSO Infrastructure Mission continues operations as an extended mission and does not receive funding to execute a scientific research plan. It only receives funding necessary to continue operations and associated activities (e.g., data validation, archiving).*” We recommend that HPD communicates better to the broader community the implications of a mission’s transition to HSO infrastructure.

For example:

- Are HSO infrastructure mission teams allowed to re-organize their limited budget (e.g., by reducing management) in order for science to be produced (e.g., science publications) even if they are not explicitly required to do so?
- Can a mission move from the infrastructure category to the Science Investigation category if new data acquisition can lead to specific proposals of new scientific tasks?

FINDING AND RECOMMENDATIONS ABOUT HSO INFRASTRUCTURE MISSIONS (2 of 2)

Recommendations (continued)

- We recommend HPD to track any correlation between the transition of certain missions to HSO infrastructure and the number of proposals submitted to R&A programs using data from those missions. If the R&A programs are burdened with those transitions, we may simply be shifting the limited budget problem from one area of Heliophysics to another.

FINDING AND RECOMMENDATION ABOUT R&A FUNDING LEVEL

Finding

- We commend HPD for working hard to address budget realities and providing good rationale for preserving the R&A budget in order to optimize science return and the health of the community

Recommendation

- We recommend sharing this and other decision making rules, guidelines and rationale used to determine priorities within the HPD budget more broadly with the community

FINDINGS AND RECOMMENDATIONS REGARDING SPACE WEATHER COUNCIL (SWC) ACTIVITIES (1 of 2)

Findings

- We commend the SWC for undertaking an impressive array of activities over the past year, spanning 4 tasks. They provided a thorough, informative, and easy-to-digest report on their findings. Work on each task resulted in actionable recommendations.
 - The SWC played an important role in coordinating between the SWC, SWAG, Space Weather Roundtable, and Heliophysics Decadal Survey. A key to coordination has been having members that are joint on two or more of these committees, ensuring tighter communication between the committees.
 - The SWC synthesized Gap Analysis reports from NASA and NAS Space Weather Workshops, and considered needed next steps.
 - The SWC provided recommendations to HPAC regarding the NASA Artemis and Space Biology programs.
 - The SWC provided recommendations to HPAC for improved interagency coordination (NASA / NOAA / NSF / DOD / non-US) on space weather efforts.

FINDINGS AND RECOMMENDATIONS REGARDING SPACE WEATHER COUNCIL (SWC) ACTIVITIES (2 of 2)

Recommendations

- We recommend that the SWC begin work on the following activities in the next year:
 - Continue to coordinate with other space weather groups and report on their activities to HPAC/HPD. Encourage the relevant committees (SWC, SWAG, Space Weather Roundtable) to continue to utilize the ‘joint membership model’ going forward, even after current members move out of their various roles. Report on what worked well and what could be improved for Decadal panel communication.
 - Discuss the possibility of a space weather gap filling analysis and provide recommendations to HPAC on the study’s scope.
 - Continue to report on space weather aspects of the Moon to Mars program and provide recommendations on space weather needs and opportunities.
 - Continue R2O2R discussions and provide additional recommendations to make the process more accessible to proposers. Continue exploring NASA-NSF collaborations, and international collaboration opportunities such as COSPAR and the IASWCG.

FINDING AND RECOMMENDATION ABOUT R2O2R

Finding

- We commend HPD for efforts to improve cross-agency cooperation on R2O2R. In particular, programs such as the Space Weather Centers and R2O2R leverage knowledge gained by NASA missions and research to improve space weather preparedness. These efforts enhance predictions and provide opportunities to grow essential capabilities needed to protect the nation's assets in space. However, we note that the R2O process remains difficult to navigate and it is a barrier for many researchers seeking to participate in these programs.

Recommendation

- We recommend HPD explore ways to streamline this proposal process, taking advantage of “lessons learned” from the Earth Science R2O efforts.

FINDING AND RECOMMENDATION ABOUT REPORTING PROPOSAL SUCCESS RATES

Finding

- HPD reported recent R&A proposal success rates to the committee.

Recommendation

- To further improve the information content in the messaging, we recommend that HPD include information on the success rates with respect to highly-rated proposals. For example, the success rate for proposals that were evaluated as VG-E (Very Good - Excellent) and E (Excellent) will provide valuable information on how many proposals of the highest quality could not be funded.

FINDING AND RECOMMENDATION ABOUT DUAL ANONYMOUS PEER REVIEW

Finding

- We commend HPD on the implementation of Dual Anonymous Peer Review (DAPR) for many competed research opportunities, as well as the ongoing efforts to shed light on the assessment of DAPR impacts towards the intended objectives.

Recommendation

- We recommend that HPD continue the assessment and tracking of the impact of DAPR implementation in order to attain statistically significant data allowing meaningful comparisons. Furthermore, we recommend that HPD expand appropriate metrics used for characterizing DAPR's effects on both the intended objectives (e.g., broadening support of first-time and early-career PIs), as well as potential unanticipated consequences, for example on the assessment of scientific return and achievement of project success.

FINDING AND RECOMMENDATION ABOUT HPD IDEA ACTIVITIES

Finding

- We commend HPD's IDEA activities, which have been presented to the committee in a very clear fashion, by a highly capable, enthusiastic and dynamic team.

Recommendation

- We recommend that the IDEA team lead the development of metrics to assess the success and/or impact of their activities, within the limiting environment of the Paperwork Reduction Act, and present them to a future HPAC meeting.

FINDINGS AND RECOMMENDATIONS ABOUT THE HELIOPHYSICS BIG YEAR

Findings

- We find the Heliophysics Big Year (HBY) to be an exciting and potentially important theme for the Heliophysics community to build upon during solar maximum 25 and the total solar eclipse in 2024.
- We note that capitalizing on unexpected geostorms, new technologies, citizen science, and NASA's Heliophysics Mission Fleet (Heliophysics System Observatory), and the idea of creating workshops internal and external to NASA are good ideas.

Recommendations

- We recommend to continue to review lessons learned from the International Geophysical Year (IGY) and International Heliophysical Year (IHY).
- We recommend that the newly designed HBY activities mentioned above leverage and build on activities already planned by heliophysicists and educators in 2024 (e.g., activities in solar eclipse and citizen science programs and DRIVE Centers).
- We recommend engaging the NSF in HBY activities given its investment in ground-based Heliophysics research and broadening impact activities.
- We recommend involving the outer heliosphere science community, particularly for large solar events around solar maximum which affect the heliosphere.
- We recommend exploring the coordination of relevant activities with industry affected by space weather (e.g. SpaceX, Google, AWS)

FINDING AND RECOMMENDATION ABOUT HESTO

Finding

- We commend the HPD on the forward-looking activities that have culminated in the establishment of HESTO and recognize its valuable role in cultivating innovations in sensing technologies for space flight hardware development that can contribute significantly to the advancement of HPD's observational capabilities.

Recommendation

- We recommend that HESTO consider a broadened exploration of additional strategic technologies that can similarly benefit the scientific objectives of HPD. For example, both academic and commercial communities have embraced the disruptive power of new paradigms for data-enabled computational technologies that extract information from large amounts of unstructured data produced by physical sensors and systems, explore patterns, and make discoveries, robust predictions, and critical decisions using a variety of emerging methodologies including machine learning. Similar approaches to novel strategic technologies utilizing rich heliophysics data (e.g., HSO) have the potential to propel heliophysics scientific exploration and discovery. While we understand that the current scope of HESTO does not preclude such endeavors, a concerted effort toward identifying and highlighting inherently multi-disciplinary research themes in advancing such technologies would have transformative potential for heliophysics science. SWAG made a similar recommendation to SWORM (R.13.4).

FINDING AND RECOMMENDATIONS ABOUT HELIOPHYSICS DIGITAL RESOURCE LIBRARY (1 of 2)

Finding

- We commend the Heliophysics Digital Resource Library in their effort to unify access to HSO data resources to streamline the process for users to find data and/or tools they require more easily, and to create an Open Science infrastructure.

Recommendations

- We recommend that the Heliophysics Digital Resource Library continue their efforts to develop ways for users to search for desired data from specific missions, etc., beyond providing links to individual HSO websites, such as keywords, science topic areas, etc.
- We recommend the development of a resource that will allow the search of selected proposals and the resultant deliverables. A funded proposal query resource, in particular, will help early career researchers in identifying relevant opportunities. As an example, see <https://www.nsf.gov/awardsearch/>

FINDING AND RECOMMENDATIONS ABOUT HELIOPHYSICS DIGITAL RESOURCE LIBRARY (2 of 2)

Recommendations (continued)

- We recommend that the Heliophysics Digital Resource Library website track the usage of data analysis tools with the goal of gauging how broad the community finds it useful. This may allow future improvements of the Library's access and ease of use for the heliophysics community.
- We recommend HPD engages with the space weather community and partner agencies to develop a plan to address space weather data accessibility across the numerous datasets these users regularly employ, and can include data from NASA, NSF, NOAA, DoD, USGS, commercial ground, commercial airborne, commercial spaceflight and civilian sources. This recommendation connects to the SWAG recommendation to SWORM, "Continue to identify and release novel and underutilized data sets that improve space weather products" (R.13.5) and "Improve access to space weather data" (R.13.2).