

NASA ADVISORY COUNCIL
HELIOPHYSICS ADVISORY COMMITTEE

September 20-21, 2022

Teleconference

MEETING MINUTES

Michael Liemohn, Chair

Janet Kozyra, Executive Secretary

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Tuesday, September 20, 2022

Overview of Agenda

Dr. Janet Kozyra of the NASA Heliophysics Division (HPD) welcomed the members of the Heliophysics Advisory Committee (HPAC). She was continuing to serve as HPAC's Designated Federal Officer (DFO) and Executive Secretary while Dr. Kelly Korreck of HPD went through the approval process for those roles. HPAC was subject to the Federal Advisory Committee Act (FACA) and therefore the meeting was open to public, with a public comment period on the second day. Formal minutes were being taken for the public record and all discussion was on the record. Dr. Kozyra turned the meeting over to Dr. Michael Liemohn, HPAC Chair.

Dr. Michael Liemohn, HPAC Chair, welcomed the members and took roll. On the first day of the meeting, focus would be on conducting the annual Government Performance and Results Act Modernization Act (GPRAMA) performance review. Day 2 was to have updates and presentations on topics of interest. The meeting was beginning with a presentation by Dr. Nicola Fox, HPD Director.

Welcome Remarks, Remembering Pat Doherty, and HPD Update

Dr. Fox began her presentation by acknowledging the sad and tragic passing of Ms. Patricia Doherty in July. Ms. Doherty had been a member of HPAC and was chair of the Space Weather Council (SWC). She did amazing work in space weather.

In better news, Dr. Matina Gkioulidou became a U.S. citizen earlier on this first day of the meeting.

Currently, there are 20 operating missions in the Heliophysics System Observatory (HSO), with another 13 missions in formulation and 1 under study. HPD is moving ahead with HelioSwarm and the Multi-slit Solar Explorer (MUSE), both of which are Medium Explorer (MIDEX) missions. NASA will partner with the European Space Agency (ESA) and the Japanese Space Agency (JAXA) in the Extreme Ultraviolet High-Throughput Spectroscopic Telescope (EUVT). Because the Solar Cruiser mission had schedule and budget issues, NASA decided not to confirm it. However, the team did a great job and the Agency still wants this kind of high-risk/high-reward (HR/HR) mission in its portfolio. The Small Explorer (SMEX) Announcement of Opportunity (AO) was out.

The International Aeronautical Congress (IAC) meeting had a great lecture on Solar Orbiter (SO) and Parker Solar Probe (PSP) operating in concert. PSP recently completed encounter 13, which is just over halfway through the prime mission. SO provided a lot of data from a large coronal mass ejection (CME) it encountered near Venus, and the downlink was in progress. The Voyager probes have been providing science for 45 years and are NASA's longest operating missions. They are still doing amazing things and the crossing of the heliospheric boundary was a huge accomplishment.

HPD has released two AOs for Explorers, one for SMEXes and another for two types of Missions of Opportunity (MoOs). The Polarimeter to Unify the Corona and Heliosphere (PUNCH) mission will pair with the Astrophysics Division's (APD's) Spectro-Photometer for the History of the Universe and Ices Explorer (SPHEREx) to launch no earlier than April 2025. PUNCH will launch four suitcase-sized satellites, focused on the Sun's outer atmosphere. The Sun Radio Interferometer Space Experiment (SunRISE) will use a series of cubesats to form a giant radio telescope in the sky. The mission hopes to launch via the U.S. Space Force (USSF) in 2024.

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An Independent Review Board (IRB) assessment of the Geospace Dynamics Constellation (GDC) was about to be released, along with the NASA response. It is standard to have IRBs for large missions in order to ensure that they are being done right and have the necessary resources. The report is very thoughtful, and HPD will hold a late October townhall to discuss it and GDC's status in general, while also answering questions. As the mission moves ahead, some selections of interdisciplinary and instrument teams have been made and some measurement team selections are pending. The draft Request for Proposals (RFP) is in process. NASA has delayed the AO for the Dynamical Neutral Atmosphere-Ionosphere Coupling (DYNAMIC) mission, which will augment GDC. This is not a cancellation.

The Space Weather (SWx) Program has been very active; Dr. Fox reviewed recent accomplishments. Moving ahead, its focus is on Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow (PROSWIFT) actions, developing the SWx instrument pipeline, and engagement with international partners. SWC would present an update on its activities on the second day of this meeting. HPAC has been asking for more data on competed research, some of which would be presented the next day. In addition to R&A, solicitations fall under Living with a Star (LWS), SWx, Guest Investigator, and Technology segments of the HPD portfolio.

Inclusion, Diversity, Equity, and Accessibility (IDEA) initiatives at NASA are part of a long-term effort, and HPD has a working group that is looking at immediate and mid-term actions. Dr. Fox reviewed a number of these. The recently confirmed Electrojet Zeeman Imaging Explorer (EZIE) will have a student-oriented element. The three Diversify, Realize, Integrate, Venture, Educate (DRIVE) centers have some great outreach ideas; this was part of the DRIVE criteria. HPD is working with other Science Mission Directorate (SMD) divisions and a range of professional and scientific organizations to support networks for early career (EC) and mid-career scientists. There are also efforts focused on students. NASA raised its staff salaries as a result of feedback indicating that the Agency was not competitive. HPD is having staff participate in IDEA activities and, along with SMD, is developing a Code of Conduct (CoC) for mission teams. The Division is also coordinating with science activation teams.

There was to be a presentation on the Heliophysics Big Year, which will tie together three major heliophysics events occurring in 2023-25. The heliophysics Decadal Survey (DS) was underway, with 492 white papers submitted, almost double the total from the previous DS. The Steering Committee has been announced and a kick-off meeting was held in late August. NASA has asked for an ambitious but realistic science strategy. Dr. Fox described SpaceApps 2022, a hackathon to occur on October 1 and 2. The event will include four heliophysics challenges.

NASA has declared 2023 to be the Year of Open Science, with the goals of lowering barriers to entry, understanding how people use NASA data, and increasing collaborative opportunities. The Transform to Open Science (TOPS) initiative has three overarching goals: to increase understanding and adoption of open science, to accelerate major discoveries through open science, and to broaden participation by historically excluded communities.

HPD has many other activities in progress, including: investing in and modernizing data facilities; a Senior Review (SR) in 2023; support for Explorers, SWx initiatives, and ongoing missions; and technology gap and trend analysis. Dr. Fox closed her presentation by urging members of the community to keep NASA informed of their accomplishments and by asking people to volunteer for proposal review panels. She provided a number of relevant links.

Dr. Cora Randall said that some operating missions are already planning for the SR. Dr. Fox confirmed that proposals are due November 1. Dr. Rebecca Bishop said that a smallsat conference in August included discussion of the writing of inclusion plans in proposals. She wanted to know how broad this

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requirement will be and if there is a size cut-off. Dr. Fox said that HPD wants to see this on all proposals. Dr. Jesse Woodroffe added that the SWx Program is piloting use of inclusion plans through its Centers of Excellence (COEs). The goal is to integrate the lessons learned across the entire research portfolio. Dr. Bishop asked if the budgets for proposals expand for open data or if this is an unfunded mandate. Dr. Fox advised that she bring that up the following day, when there was to be a presentation. If HPAC decided to write a finding, she would be interested in how to roll this out.

Dr. Gkioulidou observed that the “ambitious but realistic” request for the DS left a lot of room for interpretation. Previous budgets would not allow ambition. Dr. Fox said that while HPD does not expect unrealistic budgets, it does expect proposals with big and audacious science. Dr. Kristin Simunac pointed out the importance of including community colleges in IDEA initiatives. Dr. Fox explained that HPD first focused on EC scientists, then grew to include mid-career, and was agnostic in regard to institutions. SMD has focused on Historically Black Colleges and Universities (HBCUs), and there is more emphasis on the systemic challenges faced by certain groups. She thought it was a great idea to expand to community colleges, and she asked Dr. Korreck to take a note on that.


Dr. John Moses of NASA said that in regard to unfunded costs, there is no cost cap for most Research Opportunities in Space and Earth Science (ROSES) proposals. Proposals compete based on content. If NASA is not able to fund as much science as previously, it will fund good science nonetheless. The requirements carry the same relative costs for everyone. Dr. Fox said that SMD is looking at ways to support open science efforts. Ms. Margaret Luce added that the hope is that some of these things will be viewed as enhancing the community. They are worthwhile investments, reflecting how NASA wants people to do things. Dr. Bishop said that nevertheless, the proposer perspective has been that these are “unfunded mandates.”

Dr. Liemohn asked about the scope of the internal IDEA working group. Dr. Fox replied that it is focused on implementation within HPD but will take community input. Dr. Korreck added that the SMD strategy is to move from inward to outward. Ms. Luce noted that there are many ways to contribute and HPD hopes to facilitate what is best for the community, as the overall context is much larger than the current internal focus.

GPRAMA Process

Ms. Jennifer Kearns of SMD provided background on GPRAMA, which requires each Federal entity to provide a strategic plan, an annual performance plan, and an annual performance report to evaluate progress in key areas. In SMD’s performance report, Performance Goals measure address milestones for missions and development. For each of the nine science Performance Goals, one SMD division’s advisory committee leads the review and committees from designated divisions provide input. The SMD science Performance Goals with primary and secondary review responsibilities are in Table 1, below. Ms. Kearns noted that the table had changed from the previous year; some of the supporting contributors were different, the Performance Goals had been renumbered, and the order had shifted. In addition, a new Performance Goal had been added for the Biological and Physical Science Division (BPSD).

Table 1

PERFORMANCE GOALS	APD	ESD	HPD	PSD	BPSD
1.1.1 NASA shall demonstrate progress in characterizing the behavior of the Earth system, including its various components and the naturally-occurring and human-induced forcings that act upon it.					

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1.1.2	NASA shall demonstrate progress in enhancing understanding of the interacting processes that control the behavior of the Earth system, and in utilizing the enhanced knowledge to improve predictive capability.		●								
1.2.1	NASA shall demonstrate progress in exploring and advancing understanding of the physical processes and connections of the Sun, space, and planetary environments throughout the Solar System.		●	●	●						
1.2.2	NASA shall demonstrate shall demonstrate progress in exploring and probing the origin, evolution, and destiny of the galaxies, stars, and planets that make up the Universe.	●		●	●						
1.2.3	NASA shall demonstrate progress in exploring, observing, and understanding objects in the Solar System in order to understand how they formed, operate, interact, and evolve.			●	●						
1.2.4	NASA shall demonstrate progress in discovering and studying planets around other stars.	●		●	●						
1.2.5	NASA shall demonstrate progress in improving understanding of the origin and evolution of life on Earth to guide the search for life elsewhere, exploring and finding locations where life could have existed or could exist today, and exploring whether planets around other stars could harbor life.	●		●	●						
1.2.6	NASA shall demonstrate progress in developing the capability to detect and knowledge to predict extreme conditions in space to protect life and society and to safeguard human and robotic explorers beyond Earth.			●							
1.2.7	NASA shall demonstrate progress in identifying, characterizing, and predicting objects in the Solar System that pose threats to Earth or offer resources for human exploration.				●						
1.2.8	NASA shall demonstrate progress in understanding the properties of physical and biological systems in spaceflight environments to advance scientific knowledge, enable space exploration, and benefit life on Earth.					●					
		●	Leading contributor				●	Supporting contributor			

HPAC was to review Performance Goals 1.2.1 and 1.2.6. To aid discussion, HPD had provided HPAC with a document containing examples of science results from the past year. The Committee was free to add any relevant items to their own document, which was to support the color ratings discussed below. Examples were to represent a clear advancement and be the result of full or partial NASA funding. The time period under consideration was roughly Fiscal Year 2022 (FY22). SMD preferred examples from peer-reviewed literature, and this was to be a high-level document rather than anything comprehensive. HPAC was asked to consider evidence to the extent needed to arrive at a conclusion. SMD would use the HPAC document as the basis of a much shorter report.

Key to the GPRAMA evaluations are the color ratings:

- GREEN: Expectations for the research program fully met or exceeded in the context of resources invested.
- YELLOW: Some notable or significant shortfalls in context of resources invested, but some worthy scientific advancements achieved.
- RED: Major disappointments or shortfalls in the context of resources invested, uncompensated by other unusually positive results.

These ratings should be within the context of the budget and resources invested. Ratings other than Green needed to have a clear rationale in the text. Finally, images were welcome. Ms. Kearns thanked HPAC for their time.

Dr. Randall asked how leading and contributing divisions were determined. Ms. Kearns explained that when SMD adjusted the Performance Goals to be more interdisciplinary a few years ago, there were discussions with each division director about this table. There was some thought of having HPD supporting the Earth Science Division (ESD) more. However, for this type of high-level review, it was decided that it was not necessary to have this as a task for HPAC every year. A more comprehensive review might include heliophysics, and ESD was still developing material for its GPRAMA review. SMD would be happy to pass along anything that seemed important and include HPAC representatives. Dr. Liemohn noted that Dr. Therese Moretto-Jorgensen was to be the HPAC representative for the planetary review.

Ms. Kearns added that SMD preferred to have three or four paragraphs of text for each Performance Goal. HPAC was being asked to vote on a subgoal, but that would not require any additional verbiage; the color rating would suffice. The document should be written at the level of an intelligent layperson, such as someone with a college degree not in science. This document is intended for the taxpayer, but probably most attention comes from Congressional staffers and the Office of Management and Budget (OMB). The HPAC report will be posted on SMD's website. Dr. Randall asked about conflicts of interest (COIs). Ms. Kearns said that SMD has not previously asked people to recuse themselves.

Discussion of Performance Goals, Accomplishments, and Voting

Dr. Liemohn led HPAC in discussing potential examples. For Performance Goal 1.2.1, Dr. Randall suggested three that addressed natural forcing: measurements of nitric oxide descent in winter combined with state-of-the-art atmospheric modeling provide a unique view of coupling between middle and upper atmospheres; Aeronomy of Ice in the Mesosphere (AIM) satellite provides new information on meteoric influx and meteoric smoke composition; and using SDO and Miniature X-ray Solar Spectrometer (MinXSS) data to improve models of solar irradiance. Dr. Goncharenko explained the importance of the volcano eruption in Tonga and advocated its inclusion in both Performance Goals. She suggested combining: observations from a suite of instruments reveal that the Tonga-Hunga volcano eruption in January 2022 triggered unprecedented atmospheric gravity waves that reached the edge of space; and upper atmosphere disturbances caused by the Tonga volcano eruption. There have been many studies published on this event. She also wanted to highlight: unexpected daily cycle of molecular oxygen densities found by the Global-scale Observations of Limb and Disk (GOLD) mission; and pronounced suppression and X-pattern merging of ionospheric equatorial ionization anomalies after the 2022 Tonga volcano eruption.

Dr. Paul Cassak recommended including two examples he considered complementary: Magnetospheric Multiscale Mission (MMS) mission cracks mystery of fast magnetic explosions in space; and MMS makes the first measurements of anomalous resistivity in magnetic reconnection. Dr. James Klimchuk cited two examples that were interesting but not necessary, though he thought the first might be combined with one of Dr. Cassak's: probing current sheet instabilities from flare ribbon dynamics; and the occurrence and statistics of Interface Region Imaging Spectrograph (IRIS) bursts. Dr. Mari Paz Miralles nominated: Solar Orbiter observes switchbacks; and Solar Orbiter observation of a solar prominence eruption up to >6 Rs. For the latter, the paper had just been accepted for publication. Dr. Klimchuk thought that the extent of the prominence was not that remarkable but the graphics were excellent.

Dr. Liemohn explained that the Planetary Science Division (PSD) had offered four candidates: PSP measurements show variation in the ionosphere of Venus over a solar cycle; simulating haze on Titan;

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ocean salinity and the faint young sun; and the role of the solar wind in the isotopic composition of Earth’s oceans. Dr. Moretto-Jorgensen liked all but the one on ocean salinity. She also thought that the atmosphere on Titan was more planetary. The other two could be in HPD’s purview, however.

Discussion turned to Performance Goal 1.2.6. Dr. Bishop advocated including near-Earth space whistler waves precipitate super-fast energetic electrons into the atmosphere, which had good synergy and modeling. Dr. Gkioulidou said that she, too, had selected this one due to the need to emphasize the relationship between space and Earth’s atmosphere, and Dr. Aroh Barjatya liked it because it demonstrated new science while demonstrating that smallsats can do good science, including in coordination with large missions. Dr. Bishop also wanted to include the examples of: the Acceleration, Reconnection, Turbulence, and Electrodynamics (ARTEMIS) spacecraft finding that lunar micrometeorite impacts reduce the magnitude of lunar surface potential; and the significance of solar wind transient evolution. The latter combined PSP and the Solar Terrestrial Relations Observatory (STEREO), and Dr. Simunac also selected this one. Dr. Barjatya wanted to include: comparing multi-point observations to models provides reasonable predictions of real-time space weather conditions; and ICON provides the first direct measurements of the neutral wind-driven ionospheric dynamo. Dr. Liemohn thought the volcano material should go with this ICON example. Otherwise, all of his examples were covered. Dr. Simunac would add Solar Orbiter as an upstream space weather monitor; she also liked the first example Dr. Barjatya had proposed, noting that it would demonstrate progress in the subgoal on which HPAC was to vote.

Continuing GPRAMA Discussion and Write-ups

After a short break, the HPAC members worked on their examples, then reconvened to review the summaries and vote. Dr. Liemohn began with Performance Goal 1.2.6. The first example discussed the whistler waves discovery. The second example addressed ICON observations of the ionospheric dynamo and incorporated the electrojet perturbations caused by the Hunga Tonga volcano eruption, showing the impacts of extreme terrestrial events on space weather. A third example focused on ARTEMIS observations of lunar dust effects of micrometeoritic impacts, which can improve modeling. Finally, PSP and STEREO-A observed solar wind disturbances that have led to better modeling. In discussion, it was decided to break the ICON sections into two paragraphs.

NASA needed two votes on this Performance Goal. First was on 1.2.6 overall. Dr. Liemohn asked if there was a need for discussion of perceived shortfalls, and no one responded. The vote, done via WebEx chat, was unanimous for a rating of Green.

The subgoal was to cover “advancing scientific understanding of background solar wind, solar wind structures, and coronal mass ejections, which can be integrated into key models used to predict the arrival time and impact of space storms at Earth.” Dr. Liemohn again asked if there was a need for discussion of perceived shortfalls, and no one responded. The vote, done via WebEx chat, was unanimous for a rating of Green.

For Performance Goal 1.2.1, the first example discussed the Hunga Tonga volcano eruption and the various studies addressing its impact on space weather. The many NASA missions taking observations of this event also demonstrated the synergy between HPD and ESD. The second example addressed Solar Orbiter observations of switchbacks, and the third focused on MMS discoveries of how reconnection occurs. The final example was on PSP’s observation of cold plasma from Venus.

When asked if there was a need to discuss any shortfalls on Performance Goal 1.2.1, no HPAC members spoke up. The vote was unanimous for Green.

Dr. Liemohn said that this discussion constituted the report-out.

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In further HPAC discussion, Dr. Barjatya said that while he liked Dr. Fox's chart on R&A, he also wanted to see dollar amounts and percentages. Ms. Luce said that the next day would have a presentation with much of this information. Dr. Liemohn cautioned that there had been concern that if HPAC discussed individual programs, there could be ethics issues regarding COIs. NASA was recommending to avoid anything more specific than the three groups. While there was not enough to split flight technology between open and targeted, it was hoped that that information might be provided without running afoul of FACA. HPAC could offer qualitative findings about the program balance.

Dr. Bishop said that a lot of great things are being done but there remains a disconnect with community perception. Some proposals carry a requirement on percentage of time, and it would help to break out how much effort is needed for open data, inclusion, science, etc. There is too much scope for what they are trying to do. Ms. Luce advised making a formal recommendation. Dr. Bishop said that this would also help new proposers, as a lot goes into a well-rounded project. Dr. Cassak disagreed, stating that he is not a fan of prescriptive rules on how to spend time and would prefer that NASA fund the best science rather than have more rules. Dr. Bishop agreed about the need to avoid being too prescriptive but maintained that the community needs more guidance nonetheless. Dr. Barjatya agreed with Dr. Cassak and was concerned about accountability as well.

Dr. Randall said that inclusion and open data lead to better science, but she wanted NASA to think more carefully about the extended missions, whose budgets decrease over time. These requirements can lead to diminished science in extended missions. Dr. Liemohn thought there was guidance for extended mission proposals. Dr. Bishop asked how important data management and inclusion are in a proposal. There is a lot swirling about on the messaging and expectations. Ms. Luce explained that as SMD leadership talks about new requirements, they understand that proposals take time and that NASA needs to work out how to describe, evaluate, and communicate. She added that there is no expectation that extended missions will completely change, but rather than they will examine what makes sense, like data plans and descriptions of the data. There is also the question of whether to have open data requirements on developing missions. Leadership does struggle with these and she invited HPAC input. She suggested having a follow-up discussion to include SMD leadership. Dr. Cassak asked if inclusion stands alone or as part of IDEA. Dr. Bishop said that at the smallsat conference, it was presented that there would need to be an inclusion plan, and Dr. Randall added that the SR proposals require an IDEA plan. Dr. Cassak said that he preferred having an IDEA plan. Ms. Luce agreed, noting that diversity needs inclusion.

Adjourn

The meeting adjourned for the day at 5:45 p.m.

Wednesday, September 21, 2022

Overview of Agenda

Dr. Kozyra opened the second day of the meeting by noting that there would be a comment period for anyone outside the committee who wanted to speak. The meeting was being recorded. Dr. Liemohn then took roll and reviewed the agenda for the day.

R&A Trend Analysis

Dr. Liemohn reminded HPAC that they needed to keep this discussion at an aggregate, general level rather than go into anything specific. Dr. Patrick Koehn of NASA then introduced himself as HPD's new R&A lead. The Division's R&A funding was flat through FY16, at which point the Diversify, Realize, Integrate, Venture, Educate (DRIVE) initiative went into effect, bringing with it an increase. Among other

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things, the increased budget allowed HPD to fund a third DRIVE center instead of just the two in the original plans. The Division also increased the Early Career Investigator Program (ECIP) cadence. At the same time, SMD is promoting initiatives like Dual Anonymous (Dual Anon) reviews in order to both deepen and broaden the pool of those involved. SWx Centers of Excellence (CoE) proposals have come in, and there has been more cross-divisional work. In keeping with SMD's growing emphasis on artificial intelligence and machine learning (AI/ML), HPD will have ROSES programs in that area. Other areas of emphasis include open data and science, and the next eclipses.

The HPD budget discussions concern two numbers of interest: the President's Budget Request (PBR), and the Congressional appropriation. The former is what NASA plans against, and the latter is what NASA actually receives. From FY16 through FY21, the appropriation for HPD was larger than the PBR, with a slight decrease in FY22. When possible, the Division spends its extra funds on R&A. Focusing specifically on R&A, the PBRs and appropriations have been roughly similar. However, FY22 did not have an additional R&A appropriation, which created some challenges because HPD does not want to cut ongoing projects. Therefore, the Division had to make fewer selections, or delay them. In FY16, R&A made up 10 percent of the HPD budget. It then peaked at about 25 percent in FY21 and has now gone to about 17 percent.

HPAC had asked HPD to provide funding profiles, which Dr. Koehn aggregated as follows, noting that Flight Tech had aspects of being a catch-all:

- Open Research: Heliophysics Theory, Modeling, and Simulations (HTMS); Heliophysics Supporting Research (HSR); Heliophysics Guest Investigators Open (HGIO); Heliophysics ECIP (HECIP).
- Targeted Research: LWS-Strategic Capability (LWS-SC); LWS-Science; Space Weather Science and Applications-Operations to Research to Operations (SWSA-O2R2O).
- Flight Tech: Heliophysics Technology and Instrument Development for Science (HTIDS); Low-Cost Access to Space (LCAS), which includes suborbital; Heliophysics Flight Opportunities Studies (HFOS); Heliophysics Flight Opportunities for Research and Technology (HFORT); Heliophysics Data Environment Enhancements (HDEE); Heliophysics U.S. Participating Investigator (H-USPI); Heliophysics Mission Concept Studies (HMCS).

Variability occurs due to additional appropriations, and targeted research follows the same pattern. This is all an improvement over what existed in FY16, when the funding and selection rates were very low.

Another chart showed the numbers of submitted and selected proposals in each of the three categories from FY16 onward. The Open Research category can be misleading because changes in the R&A program altered the distribution of where some proposals went. Ms. Luce added that in FY16, there was an effort to create larger awards, obviating the need for PIs to submit more proposals, and that is a factor as well – people do not have to write as many proposals. It was less about extending duration and more about allowing a larger cap, while also introducing the DRIVE centers and larger team-oriented efforts. The numbers had been flat prior to FY16, increasing first due to DS recommendations, then due to DRIVE. Dr. Koehn said he would look at whether DRIVE was open or targeted. Ms. Luce noted that the sounding rocket program is considered infrastructure support. Therefore, it was not included here, as this is all competed research. Dr. Moretto-Jorgensen said this seemed like a good balance but she wondered about the ideal distribution among the three categories. Dr. Koehn thought that was a risky topic, as it comes not just with starting points but also with limitations. There are also opportunities that call for flexibility, like the eclipses. HPD put a lot of thought into this.

Dr. Bishop suggested communicating this more broadly at conferences, and updating it annually. It would alleviate a lot of community concerns. She asked about the FY20 Targeted number. Dr. Koehn explained

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that it was a calendar anomaly in which something shifted to the next year. Dr. Moretto-Jorgensen noted that the National Science Foundation (NSF) routinely presents these at American Geophysical Union (AGU) meetings. Dr. Koehn added that the sounding rocket program was in Flight Tech. Anything offered competitively was included in these slides.

Dr. Klimchuk said that this is what he was asking for, and he liked the categories. He asked if it might be possible to break out smaller versus larger programs. Dr. Koehn believed that would lead to complications, as the level of detail could create conflicts for anyone on HPAC due to FACA rules. He requested HPAC to put this question in writing so that he might ask if he can provide it legally. Ms. Luce explained that COIs might arise should active proposers say that one line too small or another is too big. Dr. Klimchuk said that another question would be the balance between programs that do and do not involve theory. Ms. Luce emphasized that overall, this is a good news story.

Heliophysics Big Year

Ms. Ha-Hao Hamano and Dr. Liz MacDonald discussed the Heliophysics Big Year initiative. Ms. Hamano is a Presidential Innovation Fellow helping to lead the citizen science effort. She shared a video the Big Year program is distributing. There is also a slide that has been adapted to several different audiences; she showed the version targeting heliophysicists. The Big Year is human-centered, with three overlapping components: eclipse efforts, citizen science, and mission and science topic communities. There are many missions to highlight.

Dr. MacDonald described the citizen science strategy, which includes investigations and involvement in the SMEX AO. These all dovetail with the upcoming natural phenomena of two eclipses and the solar maximum. She asked that those who might want to suggest ideas or activities reach out to HPD. The Big Year team also hopes to participate in conferences and community meetings.

Dr. Goncharenko asked about the response time for participation in conferences. Dr. MacDonald said that January was doable and asked that Dr. Goncharenko contact her regarding what she had in mind. This is all getting started and in the planning phases. Ms. Hamano explained that her fellowship is for one year, at which point she may apply to continue or pass along the work to another fellow.

Public Comment Period

The meeting was opened for comment by members of the public, but no one came forward.

HPD IDEA WG Update

Dr. Korreck and Dr. Denise Hill discussed HPD's IDEA working group (WG). NASA's Equity Action Plan for 2022 has four focus areas, and everything the HPD IDEA WG does feeds into them. Dr. Korreck reviewed the five SMD 2022-23 IDEA strategic priorities; the first three are internal and the other two are external. ROSES-2022 supports inclusion on a number of levels, including Dual Anon peer reviews, a Bridge Program, pilots of flexible deadlines, and expanded inclusion plans. While inclusion plans are not yet part of the evaluation criteria, NASA wants proposers to get used to writing them. Inclusion focuses on retention and mentoring so that everyone feels comfortable, and it flows back to recruitment. The goal is for all team members to feel that they belong. Part of the charge to the HPD IDEA WG is to be active in the SMD IDEA WG. Other elements of the charge are specific to the Division. Dr. Korreck mentioned the Picture a Scientist video, which addresses the harassment that women in science face. A follow-up is being developed for bystander training, to enable others to help where appropriate.

Dr. Hill described a number of external activities aimed at helping people see that NASA has a place for them. Examples include participation in the Smithsonian Folk Life Festival, a STEM Extravaganza at Morgan State University, and an NFL-related back-to-school event at which almost all attendees were members of minority communities. Scientists at these events talked about their work at NASA and what

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heliophysics is. In addition, there was a summer program at Wallops Island, which is in a rural area. NASA's International Space Apps Challenge was coming up and had some focus on younger audiences.

Dr. Bishop noted that some missions have small teams of two or three, and wondered whether they will need inclusion plans or just outreach. Dr. Korreck said that outreach is not what they are seeking. The effort has begun with larger programs, but inclusion can involve day-to-day interactions beyond the core group. This would cover how the group opens the mission to the community and how it is inclusive at conferences, for example. It is a culture shift and there may be a need to brainstorm. Dr. Simunac noted that she generally has no budget for conferences and she appreciates subject matter experts (SMEs) doing virtual visits to her classes. Dr. Bishop suggested additional discussion of Solar System Ambassadors, who are not typically mentioned in ROSES.

Dr. Goncharenko said that a big issue in the community is retention. The field loses a lot of talent after people have their degrees, especially women. There is a need to address pregnancy, which is more common than acknowledged. Another big issue is daycare, which affects early- and mid-career scientists. It has always been a problem but became a crisis during the pandemic. People cannot go to conferences because of daycare, and this disproportionately affects women. She wondered if it is NASA's place to think about this, and if so, whether the Agency can become a leader with solutions. Dr. Korreck said that it is important to look at the whole person at the job. It is larger than HPD can address, but they can at least look at what is being done and other barriers they might address.

Dr. Cassak asked about focusing on inclusion statements instead of IDEA statements. Dr. Korreck replied that the website says the inclusion plan was to look at inclusive workplaces, addressing culture, retention, and training. It was a smaller change than holding the standard as a larger, possibly less realistic, change. They want to start with how work is done. Dr. Liemohn agreed, saying this seemed more about the workplace at the project level rather than something systemic. Dr. Cassak said he was hoping to see CoCs and training. Dr. Korreck replied that there is already a CoC for panelists and SMD is working on CoCs for missions. She can get more on that. PI training is also being reviewed, as a National Academy of Sciences (NAS) study came out on this recently. More will be coming soon. Dr. Cassak noted that among the DS white papers is one about being trans in heliophysics. It raises some good points and there are some things that seem easy to implement. He would like the WG to look at that paper now instead of waiting for the DS. For example, it mentions requirements for restrooms at conferences, so any NASA funding for meeting attendance would call for gender inclusive restrooms.

Dr. Bishop cautioned that there will be pushback from PIs and scientists, who will complain that this is micromanaging and taking away from the focus on science. Dr. Korreck said that they have thought about this. Some of this is sociology that calls for the involvement of experts. Some people are not ready for this change, while others feel it is overdue. They have to keep moving and there will be sticky spots. NASA will help people get there. As for accountability, that will also be considered and the WG would appreciate ideas.

Open Data and Open Software

Mr. Matt McClure and Dr. Steven Crawford discussed open data and software efforts. Mr. McClure began by noting the role of the Heliophysics Digital Resource Library (HDRL), also known as "the archives." As shown on an organizational chart, it encompasses data and modeling, analysis, and collaboration. It is not enough to simply store data. To that end, a new initiative is the HelioCloud, which will provide greater opportunities for connection and access. NASA and HPD have a new data policy in order to make data fair and findable. This is in keeping with explicit White House guidance, and also addresses community issues with finding and storing data. There have been opportunities for feedback, and the timing is critical in light of explosive data growth.

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Dr. Crawford elaborated on new Federal guidance from the Office of Science and Technology Policy (OSTP). Federally funded research agencies must update their public access policies as soon as possible; establish transparent procedures to ensure scientific and research integrity; and coordinate with OSTP to ensure equitable delivery of research results and data. SMD's policy has been updated, and NASA expects investigators to comply. More guidance will be forthcoming. SMD began implementing its current data management plan about 2 years ago and is in good position to comply with the White House strategy. The three goals include: development and implementation of capabilities that enable open science; ongoing evolution of data and computing systems; and collaboration with others to promote innovation. A subgoal, to develop and implement an open data and software policy tailored to SMD, came from the community and led to the development of SMD Policy Document 41 (SPD-41).

Among other things, SPD-41 brought together existing NASA and Federal guidance. The OSTP memo resulted in a draft update being released in late 2021; SMD has reviewed subsequent RFI submissions and is preparing the revised policy for publication by the end of 2022. Dr. Crawford reviewed the current version of SPD-41, which is already appearing in ROSES. He then listed the changes that will occur in the update. Among these are citation requirements, access standards for mission software, and a mandate that science workshops and meetings be open. Proposal reviews will consider open science activities. Parallel to this, HPD updated its data management plan in early 2022.

Mr. McClure said that HPD is committed to promoting open science, and the easiest way to get people into heliophysics is to make it easy. To that end, HPD supports SMD initiatives such as TOPS and the Year of Open Science. Should the HPD data policy have any discrepancies with the updated SPD-41, the Division will seek a resolution. In reviewing the highlights of the HPD data policy, Mr. McClure emphasized that the dilemma is in how to avoid being too prescriptive or too loose. The key, however, is that all ROSES efforts must share their data. How they do it is less important than the fact that they do it. Mr. McClure reviewed the applicability of the SMD and HPD policies. All of this information can be overwhelming, so HPD has begun developing two handbooks, one for data providers and another for users. The Division expects to release these in the next year.

Dr. Crawford described support for heliophysics open data within ROSES-22. This will involve an upgrade of HDEE, along with awards for Supplemental Open Source Software (SOSS). The latter would add a software component to an existing R&A award. In closing, Mr. McClure emphasized that they want community feedback for this ongoing effort, which will build the infrastructure heliophysicists need for the future. As this is a change, they want to be flexible.

Dr. Bishop asked about the level of data involved in discussions of no exclusive periods. On metadata, quality control will be necessary to prevent false results. Mr. McClure said that SPD-41a will have data level definitions, and there is time for calibration. Generally, all data need to be available, but SMD is allowing HPD to determine the level of data that works best for the community. The team has received a lot of input about quality assurance. Missions will need to have an identified contact to handle it, though this does not have to be a standalone position. However, that person will need to communicate from the beginning. Dr. Crawford added that the policy has no period of exclusive access, but it does have a calibration period of up to 6 months, and researchers can request variances. Level zero data are not expected to be made available, but level one data should be. The policy describes them. Dr. Bishop pointed out the need for standardization across missions in the area of quality assurance. Mr. McClure agreed and said that the team is looking at this.

Dr. Randall pointed out that this is not a trivial thing. People submitting new proposals will have to look at this, while existing missions will have an enormous job in transferring to new formats. She asked about the budget for this effort, which seems enormous. Mr. McClure said that the policy does not apply to legacy missions, so anything operating now will not have to comply. Dr. Crawford agreed, saying that the

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plan is to be forward-looking. Current missions should comply to the extent they can. Future missions should include this cost in their budgets. Dr. Randall thanked them and said she appreciates the handbooks. Missions tend to have their own websites that provide data and products. She would like the open data team to consider that lately there has been a duplication of effort with sharing via NASA. Mr. McClure said that this was a good point, because they do not want researchers to have to choose data sources. Ms. Luce asked about new requirements that might be imposed on legacy projects in the SR. Dr. Randall added that there is unease in this area, as the current SR seems clear but the expectation is for the future to be different. Mr. McClure reiterated that this is not a requirement for current missions, even though some would like to see it.

Dr. Liemohn asked the level at which workshops and meetings must be open, and if this would extend to the project team level. Dr. Crawford said that there will be further guidance. The ways in which teams make information accessible to others is key to inclusivity. It is not reasonable for all meetings to be completely open, but teams should move in the direction of inclusivity and transparency. Mr. McClure added that this is about access. It is not punitive. Dr. Bishop asked if the requirements will apply to smaller missions like sounding rockets and cubesats, for which the only deliverables are a yearly report and a final report. Dr. Crawford said that the requirement already exists and is included in their manual. Data must be made available at time of publication. Dr. Bishop said that this makes the data a deliverable. Most PIs do not read these things. Dr. Crawford said that that is being addressed.

Space Weather Council Update

Dr. Angelos Vourlidas of the Johns Hopkins University (JHU) Applied Physics Lab (APL) presented the SWC report. SWC has held two meetings thus far: an introductory meeting in the spring and a recent meeting to gather information and take a first look at HPAC recommendations. The Committee had made several recommendations to SWC, most which he was to address, though the Council deferred action on determining the potential of the ARTEMIS and space biology programs to extend SWx knowledge.

Among the key points from the second meeting are that the DS process moves too slowly to meet NASA SWx needs, which requires mechanisms for faster progress. An example might be “sprint meetings” focused on addressing a particular gap. In addition, a lot of groups are discussing SWx, creating a need for proactive outreach to educate users on NASA’s role. As there is concern about ARTEMIS activities, this outreach includes engaging more with NASA’s Human Exploration and Operations Mission Directorate (HEOMD). Finally, there is an urgent need to re-evaluate and analyze existing studies.

In examining the role of SWC relative to other SWx advisory bodies, the Council had presentations from the Space Weather Advisory Group (SWAG) and the Space Weather Roundtable (SWR), run by the National Oceanic and Atmospheric Administration (NOAA) and NAS respectively. As a result of this discussion, the chairs of the three groups had the first of a series of quarterly telecons earlier in September in order to further clarify roles and responsibilities. SWC also discussed how to communicate these roles to various audiences. Possibilities include short articles in select publications. Dr. Vourlidas then described the three groups in more detail, pointing out that SWR is not a FACA committee and therefore is not bound by FACA regulations. Collaboration and coordination will be key in making progress. An outline of a possible one-pager described each group’s unique charge. Transparency is important.

Another topic was gap analyses. NASA has a gap report, and NAS held two workshops on the topic of planning for the SWx operations and research future infrastructure. Analyses thus far have emphasized measurements, with little done on modeling. Most of the science gaps have been identified but at this point there is no clear path forward to implementation. Targeted analyses are also missing. SWC has proposed a gap analysis focused on the cis-lunar radiation environment, to take a comprehensive look at infrastructure, observation, and modeling gaps. In addition, possibly to run in parallel, SWC has

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suggested testing how best to close a specific measurement gap, such as the L4 monitor supporting cis-lunar radiation forecasting. This might be done in conjunction with SWR.

Members of SWC have met with NASA's Moon to Mars (M2M) office and the Space Radiation Analysis Group (SRAG) at the Johnson Space Center (JSC) to discuss how SWC might assist in deep-space exploration. M2M is under increasing pressure, so any help will be useful, especially in the area of prediction. The models are not sufficient. While the current ARTEMIS plans offer an opportunity to test warning protocols for astronaut protection, the scenarios do not yet include anything for Solar Energetic Particle (SEP) events. This situation might lend itself to a tabletop exercise among the concerned parties. Dr. Vourlidas added that missions outside of HPD rarely consider SWx effects, yet they are seeking related help from M2M, which, as noted, is dealing with a burgeoning workload. NASA needs to oversee a shift in how this is addressed. It might also be necessary to identify which entity will be responsible for astronaut safety during SWx events. The current funding horizon is short and based only on the landing schedule.

Dr. Goncharenko said that she had worked on the recommendations with Ms. Doherty in May and was amazed at the progress made in such a short time. She asked about interagency collaboration, especially since that has been a community concern. Every scientist understands the need to work across agencies, but it can be difficult to collaborate because the timeframes differ. For example, NSF has short-term grants while HPD generally puts together longer term plans for implementation. Some NSF instruments have short lifespans compared to those sponsored by NASA. Dr. Vourlidas agreed, adding that NSF relies on NASA space assets, although a case could be made for more ground-based work. SWC is not going to tell NSF what to do, but he will note this at the next SWC meeting because he agreed that not everything needs to be done from space. Geospace is a fruitful area. Dr. Goncharenko mentioned the need for model development and quicker responses.

HPAC Work Session

Dr. Liemohn led discussion of possible findings and recommendations. He wanted to begin by congratulating the R&A program and the Heliophysics Big Year initiative. The HPD IDEA WG should be congratulated, with a mention of inclusion plans and possible enforcement of compliance. On open data/open science, HPAC congratulated the team on its work and stated that it looks forward to the handbooks, as well as the ROSES roll-out. The Committee would like more detail on the requirements for smaller grants, along with information on compliance plans. SWC was also receiving congratulations on progress thus far.

Dr. Liemohn asked if anything from Dr. Fox's presentation warranted a finding or recommendation. Drs. Barjatya and Moretto-Jorgensen asked if HPAC could get the presentations in advance for future meetings. Dr. Korreck said she could email them. Dr. Bishop asked if Dr. Fox's cost breakdowns could be updated annually and presented to AGU. She also noted that, regarding the "leaky pipeline," mid-career people can be overwhelmed and some even consider leaving because the requirements pull away from the science. Dr. Klimchuk noted the recent shift away from open to directed research, and asked for a finding emphasizing the need for open research. He also sensed a shift to large programs that might be at the expense of essential smaller programs. Therefore, the breakdown between large and small would be helpful to share with HPAC and the community. Dr. Moretto-Jorgensen also wanted to raise the issue of small versus large programs. NSF provides much greater detail and she did not understand the secrecy at NASA. Dr. Barjatya disagreed, because too much granularity could jeopardize HPAC members' ability to propose. NASA should be allowed to direct research as long as they can justify it. The proportionality should be shown but not the rest. Dr. Liemohn said that since HPAC members were not unanimous here, he did not want to have a finding. Instead, he suggested that the Committee ask the NASA Office of General Counsel (OGC) for more direct advice about what they can access and discuss. Dr. Klimchuk noted that many of his projects would be considered mid-sized, and it seems like a difficult area compared

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to large or small. Dr. Bishop cited scope creep and the possible disappearance of small projects. Dr. Liemohn disagreed and wanted to see the breakdown before writing a recommendation.

Dr. Simunac urged the IDEA WG to reach out to community colleges. People who leak out of the pipeline often end up there. In addition, the distinction between outreach and inclusion should be clearer. They seem to overlap. Dr. Randall sought a recommendation that research solicitations include resources for PIs. She also wanted to recommend that NASA be careful about unfunded mandates affecting existing missions. Dr. Goncharenko asked for a recommendation that the IDEA WG have more focus on retention, which could be part of inclusion. She would like to see more detail. Specifically, she wanted NASA to think about retention of early and mid-career people. Dr. Miralles observed that budgets are tight, which means projects with postdocs and students call for more resources. It is hard to keep people when they see scientists writing proposals all the time. Added requirements compounds the issue.

Dr. Gkioulidou said that they still have not seen what this will look like, which led her to be concerned that the requirements will lead to exclusion instead of inclusion, especially at smaller institutions. NSF is problematic in this area. She did not want to comment further until she had more information, however. Dr. Liemohn suggested that this could be something HPAC could read about before a meeting. Dr. Moretto-Jorgensen asked for more data on the Dual Anon initiative. Dr. Cassak stated that he strongly favors inclusion statements. NSF is not overly prescriptive in their inclusion requirements, which might be a direction for NASA. However, it is important to do this in order to overcome centuries of inequities. Dr. Randall said that DRIVE solicitations require a broadening impacts discussion. She wondered if that might be a better way to phrase it. Dr. Liemohn liked asking NASA and HPD to consider how they might word or implement that.

HPAC Report Out and Closing Remarks

Dr. Liemohn said that Ms. Luce had heard everything they said, which would constitute the report-out. He reviewed his notes. On the R&A analysis, HPAC thanked HPD for the report, which included good information that addressed the Committee's request. HPAC would like this to be presented more broadly, along with regular updates. HPAC also wanted an analysis of large, medium, and small projects, along with what is data-focused versus modeling. By the next meeting, the Committee would like more clarification on what they can discuss regarding specific budgets. A finer level would be great if OGC allows it; regardless, HPAC would like to hear more.

HPAC congratulated the Heliophysics Big Year and the HPD IDEA WG on their efforts. For the latter, there were a couple of recommendations. First was to connect with smaller organizations. HPAC also wanted the WG to consider and report back how they plan to roll out inclusion plans in ROSES, and how this will be evaluated and enforced. The NSF wording on broader impacts is worth considering. The Committee wanted a clearer definition of outreach versus inclusion. HPAC wants NASA to think of this from the perspective of early and mid-career people. NASA solicitations should include NASA resources for IDEA, to enable proposers to tap into what exists instead of searching for it. HPD should think about what these requirements might mean in terms of programs and funding, especially for existing missions.

The open data and science plan was good, and HPAC looks forward to hearing more about implementation at smaller levels. Here, too, the Committee wants NASA to specify relevant resources in ROSES. SWC had a great start. HPAC would like data on preliminary implementations and qualitative discussions on these efforts. Dr. Liemohn planned to mention GPRAMA in the letter, but that report would be a separate document.

There was some concern that the meeting was not long enough, especially on the second day, along with some frustration that it was not possible to meet in person. Dr. Liemohn's term as chair was coming to an end, and Dr. Moretto-Jorgensen will fill that role going forward. Ms. Luce also mentioned that several

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other members were rolling off the Committee, including Drs. Goncharenko, Klimchuk, Randall, and Miralles. Terms were to end on October 1. In addition, Drs. Tomoko Matsuo and Allison Jaynes had left due to other commitments. Ms. Luce promised to provide a list of when member terms end, adding that she is always struck by how good it feels to get these perspectives, which clearly come from outside NASA headquarters and which always make HPD staff think. They feel closer to the community thanks to these interactions.

Dr. Liemohn thanked the participants and said he would send out the reports for comment.

ADJOURN

The meeting was adjourned at 3:13 p.m.

Appendix A Participants

Heliophysics Advisory Committee Members

Michael W. Liemohn, University of Michigan, Chair
Therese Moretto-Jorgensen, Ames Space Flight Center, Vice Chair
Janet Kozyra, NASA Headquarters, Executive Secretary
Aroh Barjatya, Embry Riddle
Rebecca Bishop, Aerospace Corporation
Paul Cassak, West Virginia University
Matina Gkioulidou, Johns Hopkins University
Larisa Goncharenko, MIT Haystack Observatory
James Klimchuk, Goddard Space Flight Center
Mari Paz Miralles, Smithsonian Astrophysical Observatory
Cora Randall, University of Colorado at Boulder
Kristin Simunac, St. Petersburg College

Other

Karla Cabera	Matthew McClure
Steven Crawford	Rachel Morrow
Nicola Fox, <i>Heliophysics Division Director</i>	John Moses
Ha-Hao Hanano	Arik Posner
Denise Hill	Abigail Rymer
Jennifer Kearns	Elizabeth Sheley
Patrick Koehn	James Spann
Kelly Korreck	Walter Twetten
Margaret Luce	Angelos Vourlidas
Liz MacDonald	Jesse Woodroffe
Amy Marshall	Alan Zide

Appendix B
Advisory Committee Membership

Michael W. Liemohn, Chair

University of Michigan

Therese Moretto-Jorgensen, *Vice Chair*

Ames Space Flight Center

Janet Kozyra, *Executive Secretary*

NASA Headquarters

Aroh Barjatya

Embry Riddle

Rebecca Bishop

Aerospace Corporation

Paul Cassak

West Virginia University

Matina Gkioulidou

Johns Hopkins University

Larisa Goncharenko

MIT Haystack Observatory

James Klimchuk

NASA Goddard Space Flight Center

Mari Paz Miralles

Harvard-Smithsonian Center for Astrophysics

Cora Randall

University of Colorado at Boulder

Kristin Simunac

St. Petersburg College

Appendix C
Agenda

Tuesday, September 20, 2022		
13:00	Overview of Agenda	Dr. Michael Liemohn, Chair
13:05	Welcome Remarks and Remembering Pat Doherty	Dr. Nicola Fox, NASA
13:15	GPRAMA Process	Jennifer Kearns, NASA
13:30	Discussion of Performance Goals, Accomplishments and Voting	Dr. Michael Liemohn, Chair
15:30	BREAK	
15:40	Continuing GPRAMA Discussion and Write-ups	Dr. Michael Liemohn, Chair
16:40	BREAK	
16:50	HPD Update	Dr. Nicola Fox, NASA
17:45	HPAC Report on GPRAMA Results	Dr. Michael Liemohn, Chair
18:00	ADJOURN	

Wednesday, September 21, 2022		
11:00	Overview of Agenda	Dr. Michael Liemohn, Chair
11:05	R&A Trend Analysis	Dr. Patrick Koehn, NASA
11:15	Heliophysics Big Year	
11:25	HPD IDEA WG Update	Kelly Korreck, NASA Denise Hill, NASA
12:15	Public Comment Period	
12:30	BREAK	
13:15	Open Data and Open Software	Dr. Matt McClure, NASA
14:00	Space Weather Council Update	
14:45	Closing Remarks	
15:00	ADJOURN	