NASA ADVISORY COUNCIL

HELIOPHYSICS ADVISORY COMMITTEE

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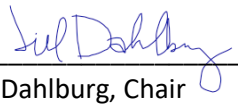
MEETING MINUTES



Jill Dahlburg, Chair

Janet Kozyra, Acting Executive Secretary

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Wednesday, November 29

Welcome, Overview of Agenda

Dr. Janet Kozyra, serving as Designated Federal Officer for the Heliophysics Advisory Committee (HPAC), opened the meeting. HPAC was established under the Federal Advisory Committee Act (FACA) and operates under FACA requirements. The meetings are open to the public. Formal minutes are taken for the public record and published on the NASA website. Committee members must recuse themselves from any discussions that constitute a conflict of interest.

Dr. Jill Dahlburg, HPAC Chair, welcomed the Committee members and had them introduce themselves. She then reviewed the meeting agenda. The primary work for this meeting was to produce the Government Performance and Results Act (GPRA) Modernization Act (GPRAMA) assessment of NASA's Heliophysics Division (HPD) activities since the previous GPRAMA assessment in August of 2016. The agenda included sessions for HPAC members to work on GPRAMA and other tasks.

Heliophysics Division Overview

Ms. Peg Luce, Acting HPD Director, welcomed the HPAC members. The recent solar eclipse presented an exciting opportunity to focus on heliophysics and engage people in many different ways. It served as an opening for discussing upcoming missions and other work.

Mr. Steven Clarke, the recent HPD Division Director, is on detail to the Office of Science and Technology Policy (OSTP), and the expectation is that he will stay there. The Science Mission Directorate (SMD) is soliciting candidates for the position to work through the Independent Personnel Act (IPA) or on an open-ended detail. HPD has been thinly staffed, but now has five new staff members, three of whom are on detail. There have also been some promotions.

HPD strives to align with Decadal Survey (DS) recommendations. These include completing the current program; implementing the Diversify, Realize, Integrate, Venture, Educate (DRIVE) program; expanding the Explorer program; restructuring the Solar Terrestrial Probe (STP) program as a PI-led, moderate-scale flight program; and implementing a large Living with a Star (LWS) mission comparable to the Geospace Dynamics Constellation (GDC). Ms. Luce reviewed some of the Announcements of Opportunity (AOs) and Request for Information (RFI) activities related to the DS recommendations.

The mission fleet includes a number of pending missions. The launch date for the Ionospheric Connection Explorer (ICON) is rescheduled from late 2017 to some time in 2018, while it awaits resolution of a spacecraft issue. The Global-Scale Observations of the Limb and Disk (GOLD) mission will launch in early 2018 on a communications satellite. The Parker Solar Probe (PSP) will launch in July, 2018. The solar probe cup has been integrated with the observatory, but there are separation nut issues on the spacecraft. The Space Environment Testbed (SET) bed will go up in April, 2018. Although the current launch date for the Solar Orbiter is February, 2019, it is facing a delay of 1 year. This is a European Space Agency (ESA) mission in which NASA is participating. NASA has delivered its instruments, and the budget can cover a delay. The instruments are being integrated by Airbus in the United Kingdom.

HPD selected five Small Explorer (SMEX) missions for Phase A competition, three Missions of Opportunity (MOs), and one Category 3 MO for technology development. Interstellar Mapping and Acceleration Probe (IMAP) proposals are in review, and responses to the GDC Request for Information (RFI) are due. In addition, the GDC Science and Technology Definition Team (STDT) is forming, and there are mission study teams forming for additional missions. A number of the SMEX and MO selections propose using cubesats and smallsats.

Ms. Luce reviewed some of the more active inter-agency, intra-agency, and international collaborations. The Space Weather Action Plan (SWAP) is an example of an ongoing effort that involves other agencies. Funding for Research and Analysis (R&A) does not cover all of the proposals HPD would like to accept, and selection rates are therefore low. However, there is an upward trend in the President's Budget Requests (PBRs) and in actual funding. For example, the total PBR increase for Fiscal Year 2018 (FY18) over recent years is $41 million. There is no indication that Congress will make any dramatic changes to this request. By FY20, R&A funding is projected to be $65 million more than the FY17 funding.

The Solar Probe Plus mission was renamed the Parker Solar Probe in honor of Dr. Eugene Parker, who discovered the solar wind. NASA also recently marked the 40th anniversary of the Voyager mission. The Agency expects Voyager 2 to cross the heliopause in the next 18 months or so. Heliophysics is a system science, as shown by recent observations of a solar storm viewed by 10 spacecraft, and subsequent modeling. NASA hopes to increase the number of observations using new platforms. Ms. Luce showed depictions of the recent solar eclipse from various science perspectives. Overall, HPD is on track, things are going well, and the Division is lining up future opportunities at a good cadence in order to conduct much rich science.

Discussion
Dr. Vassilis Angelopoulos asked about the projected cadence and structure of MOs. Ms. Luce replied that the budget assumes an alignment of an MO with each AO. However, HPD understands that this can demand a lot of time from proposers. Therefore, Division staff are discussing whether to have a combined common call. The decision will be made in time for the upcoming IMAP MO.

Regarding focus, HPD is not anticipating a change, nor has there been any policy against the climate work. The SWAP is continuing. An upcoming discussion about cubesats would include targeted opportunities. An international report on heliophysics is being reviewed internally and with international partners, but HPD was not at liberty to discuss it further at the time of the meeting. Launch dates for ICON and GOLD should be finalized by early 2018; Ms. Luce was to receive more information the next day, but she was unsure how much detail would be available then.

Dr. Paul Cassak asked about High End Computing (HEC), another topic on the agenda. Dr. Jeffrey Hayes said that NASA is working on this diligently and has acquired more HEC capacity in order to meet demand. The Agency has also changed the way it allocates existing capacity. It will take another couple of years to reach the HEC capacity goals. In the interim, HPD could buy its own unit for about the price of a sounding rocket. Dr. Thomas Zurbuchen, SMD Associate Administrator, is very interested in this, especially regarding standards. Cloud computing needs to be studied more, as there are costs in moving data back and forth. Each Federal agency has its own rules about computer access, which might affect the ability to share equipment with other agencies.

Dr. Heather Elliott asked about the Research Opportunities in Space and Earth Sciences (ROSES) Guest Investigator (GI) announcement and when there will be an update on the reviewer process. Ms. Luce said that the ROSES GI results will be available soon. In addition, Dr. Elsayed Talaat was on the agenda to discuss aspects of R&A, which would provide an opportunity to ask about reviewers.

Dr. Dahlburg asked why the Senior Review (SR) was now reporting to HPAC. It had not reported to the HPAC predecessor, the Heliophysics Subcommittee (HPS). Dr. Hayes explained that it was determined that the SR gives advice to the U.S. government. Therefore, SRs and STDTs must now be FACA committees. The final SR results were to be issued in about a month, at which time the missions would receive their SR guidance. HPAC was to receive a presentation on preliminary findings, recommendations, and rankings the next day.

Dr. George Ho asked about the space weather agreement between NASA and the National Oceanic and Atmospheric Administration (NOAA). Ms. Luce said that the Memorandum of Understanding (MOU) focused on modeling. NOAA is responsible for the space weather observations, and is looking at how well it can do an observatory in the face of a diminished budget. It is not NASA's place to provide that observation. The two agencies are talking about a collaboration on the IMAP mission, but NASA intends to stay within its organizational boundaries.

Dr. James Klimchuk asked if HPD would reinstate the Management Operations Working Groups (MOWGs). Ms. Luce replied that she believed they would reappear in some format, and she had heard that the science community wanted them. She asked if there were any controversy attached to them. Dr. Dahlburg said that they made the HPS work easier. Dr. Hayes noted that they might be reconstituted as Program Analysis Groups (PAGs).

Preliminary Discussion of GPRAMA Process

Ms. Jennifer Kearns of SMD provided the background of GPRAMA, which requires Federal entities to provide a strategic plan, an annual performance plan, and an annual performance report to evaluate progress made in key areas. HPAC was being asked to evaluate NASA progress on the three Annual Performance Indicators (API) for heliophysics. In determining NASA's success in meeting these science performance goals, HPAC was free to evaluate anything that occurred since the previous GPRAMA review, which was conducted in August, 2016. They were to consider only items funded in whole or in part by NASA, though that funding did not need to come from HPD specifically. Dr. Kozyra had sent the members a document summarizing accomplishments that they could consider, though they were not bound to using those examples. Regardless of the source, SMD wanted sufficient material to back the conclusions. The final text in the Agency's Annual Performance Report (APR)will be a portion of what HPAC sends to SMD, edited for length and layperson-friendly language.

Another requirement was for a color rating, as follows:

- A rating of Green meant that the expectations of the research program were fully met in context of the resources invested;
- Yellow meant that there were some notable or significant shortfalls, but some worthy science advancements were achieved; and
- Red meant that there were major disappointments or shortfalls in scientific outcomes in context of resources invested, uncompensated by other unusually positive results.

For any rating other than green, SMD requested a detailed explanation so that the rationale could be properly reflected in the APR. Regarding the audience, the APR goes first to the Office of Management and Budget (OMB). It is then submitted to Congress and posted on the NASA website. Dr. Kozyra noted that many of the accomplishments she provided as examples were extracted from the SR proposals.

In response to questions, Ms. Kearns gave an example of a non-green rating given several years ago by the Astrophysics Subcommittee (APS, now the Astrophysics Advisory Committee (APAC)). NASA took no action in response to the rating because the issue had already been addressed by the time the rating was assigned and the report was issued. She added that, per the color rating definitions, a disappointment on one mission does not necessarily negate progress in the entire area.

The APIs are as follows:

17.1 – Demonstrate planned progress in exploring the physical processes in the space environment from the Sun to Earth, and throughout the solar system.

17.2 – Demonstrate planned progress in advancing understanding of the connections that link the Sun, Earth, and planetary space environments, and the outer reaches of the solar system.
17.3 – Demonstrate planned progress in developing the knowledge and capabilities to detect and predict extreme conditions in space, to protect life and society, and to safeguard human and robotic explorers beyond Earth.

Dr. Dahlburg suggested that HPAC work in small groups, one for each API. Dr. Mari Paz Miralles was to chair the group for 17.1, Dr. Angelopoulos was chair for 17.2, and Dr. Michael Liemohn was the 17.3 chair. Other HPAC members were to sort themselves into the three groups based on their expertise. Using the template from 2016, the groups were to develop a summary statement and three or four examples, with a first draft due the following day, written for the intelligent layperson. Dr. Liemohn added that the basis for the review was the science, as the missions have their own report. Dr. Angelopoulos noted that it was fine to shift topics to another group, as there is usually some mixing and matching.

Committee Work Session on GPRAMA

After meeting, the small groups each gave a quick update. Each group said that they had identified projects for examples, assigned tasks, and expected to complete their first drafts the following day.

Adjourn

The meeting adjourned for the day at 4:57 p.m.

Thursday, November 30, 2017

Briefing on Senior Review

Dr. Angelopoulos recused himself from this session due to his status as Principal Investigator (PI) for the Time History of Events and Macroscale Interactions during Substorms (THEMIS) mission, which had been subject to the SR.

Dr. Hayes listed the 16 operating missions invited to the SR. He noted that the Solar and Heliospheric Observatory (SOHO) is considered essential infrastructure and does not have to go through the SR, as determined by SMD and the Inspector General (IG). The SR panel consisted of 14 reviewers, who met at the end of October and beginning of November. The SRs will now go to a 3-year cadence. An IG audit of the SMD SR process resulted in a favorable review for HPD, but the IG recommended that the Division provide more documentation, which this SR sought to do. The IG also recommended against using an algorithm on operating mission costs, as it was applied unevenly and was not always appropriate. Therefore, this SR evaluated costs differently.

The SR focused on the science merit of the missions for Fiscal Years 2018-22, and also evaluated each mission's contribution to Heliophysics System Observatory (HSO). The mission proposals included Prioritized Science Goals (PSGs), and the missions were to demonstrate progress on PSGs from the previous SR. The SR panelist also assessed cost efficiency, data availability and usability, and mission vitality. They provided findings on the implementation strategy of the Mission Operations and Data Analysis (MO&DA) portfolio. Finally, the panel made findings and recommendations on the continuation, enhancement, reduction, or termination of the individual missions. The missions were asked for the consequences of the in-guide budgets, and for reasonable over-guide budgets.

The SR team was seeking HPAC's endorsement of the report. Specifically, the team wanted HPAC to note whether it was satisfied that the SR was fair, unbiased, and effective, and whether it was satisfied with the report. HPAC could also make findings and recommendations.

Dr. Hayes noted that everyone on HPAC probably had some degree of conflict. After further discussion, Dr. Cora Randall recused herself on the basis of being the PI for an instrument on the Aeronomy of Ice in the Mesosphere (AIM) mission, as well as the AIM project manager.

Dr. Hayes explained that, although it was a FACA committee, the SR was closed to the public due to the proprietary and budgetary data that were shared. Mission proposals tracked to a 5-year budget horizon. The full report will be published as a PDF on science.nasa.gov once it is finalized, and will include the HPD disposition of the findings. The evaluation addressed three criteria: A. science merit; B. relevance and responsiveness; and C. technical capabilities and cost reasonableness. Similar to peer reviews, the SR panel used the Excellent through Poor rating system.

Dr. James Spann, SR Chair, further described the ratings. Each mission was subject to two votes, one on individual science merit and one on contribution to the HSO. The number of votes per mission ranged from 14 to 11, depending on the number of conflicted panelists. Drs. Spann and Hayes took the median of the votes and plotted the standard deviations. For both mission science grades and HSO contribution, the plotting was tight, though the HSO ratings had a bit more of a spread. They did not rank the missions.

Dr. Spann next reviewed general findings and recommendations for HPD:

1. Assess extending the prime phase of a mission, up to 5 years for large strategic missions and up to 3 years for smaller missions. When the prime phase ends at 2 years, many missions are still entering their stride. If implemented, this recommendation will result in substantially more science return at a reasonable cost.
2. Create an opportunity for the community to propose a coordinated HSO observing campaign. This will better realize the value of the HSO.
3. Establish a team to prepare the mission archive presentation, rather than having a single individual. A broader perspective will add depth.
4. Establish a community-wide, cross-agency workshop to assess options for broad solar and space physics data retrieval.
5. Establish a requirement for future heliophysics AOs to make data archived and retrievable in the future. The recommendation is not retroactive, though that is not precluded.
6. Require responses to the next SR proposal call to include a table stating what science will be done with the in-guide budget and what can be done with the over-guide. Not all missions discussed the in-guide budget this time. The table can be simple, but the information is necessary.

There was also a finding, which grew out of a difficult conversation. The SR panel felt like it would be valuable to assess which missions have the least impact on the overall field, by specialty. After discussing this, the panel found that the Reuven Ramaty High-Energy Solar Spectroscopic Imager (RHESSI) satellite, the Wind mission, the Two Wide-Angle Imaging Neutral-Atom Spectrometers (TWINS), and the Thermosphere, Ionosphere, Mesosphere Energetics and Dynamics (TIMED) mission would have the least impact on the science. However, these are not the lowest-ranked missions for either science or HSO impact. Instead, while RHESSI and TWINS are at the bottom of each ranking, TIMED and Wind are in the middle.

The SR document provides a rationale for ranking each of these four missions as having the least impact on the HSO within their specialties. For example, Wind has some unique aspects, but the Advanced Composition Explorer (ACE) and NOAA's Deep Space Climate Observatory (DSCOVR) mission cover the same area of science. TIMED is valuable, but GOLD and ICON will take over some of the science. By contrast, AIM was rated low and has less of a contribution to the HSO, but it covers unique area, which makes it valuable. While RHESSI provides unique x-ray imaging, it is struggling to perform and seems unlikely to last much longer. If its data were not available, it would have the least impact compared to other missions in its specialty. TWINS is in a similar situation.

In answer to a question about the Van Allen Probes (VAP), Dr. Spann explained that the mission is strong on both scientific merit and responsiveness and relevance. However, there was an issue in the area of cost reasonableness, and their approach was off. Dr. Elliott observed that the HSO seems to have a bias in favor of solar wind and IMF research since this data gets used by the magnetospheric and ionospheric communities. Dr. Spann replied that that was taken into account. Some missions provide data that are broadly applicable, while others have a narrower scope and are valuable in their uniqueness. The panel tried to differentiate. Dr. Klimchuk thought the criteria implied that system science is more important than mission science. Dr. Spann said that there has been an ongoing effort to achieve balance, and the pendulum has swung in both directions.

Dr. Spann then summarized the rationale for identifying the four missions of least impact. RHESSI has both a narrow focus and instrument issues. Wind collects information that is seldom cited and somewhat duplicated by ACE and DSCOVR. TWINS data are hard to access and the mission is struggling. TIMED data will be largely overlapped by ICON and GOLD. All of these missions have good aspects, and the determination that they have the least impact does not indicate that anything will happen with them.

The individual mission findings and recommendations are summarized below:

- ACE and Hinode: No findings or recommendations.
- AIM: This mission could use better data products.
- Geotail: The team should develop an engagement strategy to present to NASA management.
- Interstellar Boundary Explorer (IBEX): The mission team should take steps to make data more easily accessible.
- Interface Region Imaging Spectrograph (IRIS): A finding about the budget is no longer necessary since the European Space Agency (ESA) has approved more funding.
- Magnetospheric Multiscale (MMS): First, the team should look for ways to lower mission costs. The second recommendation is to consider how to shift the operating paradigm toward more autonomous operations.
- RHESSI: The team should begin archiving the data now, as the trend points to the end of the mission's life.
- SDO: The finding is that this is a valuable asset for the HSO. The first recommendation is to separate out citations to distinguish those that refer to SDO as a primary data source from those citations using SDO as context. The second recommendation is to look at mission costs and operations.
- Solar Terrestrial Relations Observatory (STEREO): The evaluation was of STEREO A, since STEREO B is not available. The SR found that the websites are unclear regarding acronyms, which the team should fix.
- THEMIS: The team only addressed over-guide budget science, not in-guide budget science.

- TIMED: The first finding is that this mission will support the GOLD and ICON missions. The second finding notes data issues. The recommendation is for the team to focus on calibrating the new Timed Doppler Interferometer (TIDI) measurements.
- TWINS: The recommendation is for more timely posting of the images online and that data be made more available.
- VAP: An issue with the budget is being worked out.
- Voyager: The first recommendation is to develop a succession plan. The second is to develop and implement a data archiving and storage plan. Finding 1 addresses data availability, Finding 2 calls for support of the use of supercomputing, and Finding 3 notes that Voyager and IBEX complement each other and might benefit from more synergistic activities.
- Wind: This mission provides strong science and unique observations, and the panel wanted to recognize this contribution.

Regarding the timeline for Voyager, Dr. Spann said that the mission will begin cycling instruments off in 2 to 3 years, and Dr. Hayes elaborated, stating that in 2020, they will determine which instrument goes off first, after which they will turn off instruments at a 12 to 18-month cadence. The mission end is still a decade out. Regarding documentation, Dr. Spann explained that the hope is to have some knowledgeable people not on instrument team who can give them more insight as to how data are derived. It could be they are doing best they can, but there needs to be an assessment.

Dr. Hayes explained that the missions were required to propose to the in-guide budget, as well as an over-guide. The overall funding available for these 16 extended missions is about $90 million, and the over-guide total comes to $106.5 million. MMS had the biggest over-guide request, $11 million more than the in-guide amount; the in-guide figure was too low. After some recalculations that included substantial unspent funds carried over, it appears that MMS can get its final over-guide. That issue has been resolved.

THEMIS sought an over-guide amount in later years. Shifting VAP funds forward from later years should address that mission team's request. VAP runs out of fuel in mid-2019. Dr. Hayes explained that he tries to get the mission teams to differentiate science, operations, and science operations in their proposals. This varies by mission. The larger missions enable more science internally, and most of the older missions are from a different paradigm with less embedded science.

Dr. Dahlburg called for two votes. The first question was whether HPAC thought the SR panel did a fair, unbiased, and good job. The vote would have been unanimously in favor, but there was one abstention. The second question was whether HPAC was satisfied with the SR and its conclusions. Again, the vote was unanimous in favor aside from one abstention.

Dr. Klimchuk, the member who abstained from voting both times, asked for more information on the SR process. Dr. Spann said that it was very much like a proposal review. They screened the panelists for conflicts of interest, and panelists received criteria and proposals in advance. Each mission was assigned to a primary reviewer ahead of time. He and Dr. Hayes explained what they wanted at the meeting. Then the individual missions each presented to the panel, there was a question-and-answer period, and the panel caucused without the mission representatives present. Sometimes, the panel brought the mission representatives back in to answer clarifying questions. Then the primary reviewers would adjust their input. Some questions could not be answered in real time, which resulted in emails for clarification, and the missions were very responsive to these questions.

Once the mission presentations were all completed, the SR team had the panelists provide their assessments of their assigned missions. There were no minority opinions despite some vigorous discussions, nor were there any huge standard deviations in the voting. The team had planned to have a second vote, but the panel voted to stay with their original votes, so there was a single vote. At that point, Drs. Spann and Hayes presented the concept of "least impact," which resulted in another vigorous discussion. The panel decided to make the determinations programmatically in order to have balance, rather than designate bottom missions by ranking. The document is a panel document. There was no advocacy and there was great integrity in the process. Dr. Spann then read the names of the panelists, adding that it was a very collegial and cooperative group.

Dr. Klimchuk changed his to abstentions to "yes" votes. Dr. Dahlburg also checked to ensure that Dr. Roger Smith, an HPAC member participating remotely, was an affirmative vote. Dr. Smith, who had also been on the SR panel, said that he did agree with the vote, and he agreed with the presentation. He thought the outcome of the SR was fair.

Dr. Dahlburg then conducted another formal vote, which was unanimous on both questions with no abstentions. HPAC formally accepted the report.

Dr. Hayes thanked HPAC and said that the final report will likely be available online by the end of January.

Committee Work Session

HPAC members continued their work on GPRAMA. The vote was rescheduled for the next morning in order to give the members sufficient time to write.

Briefing on Internal Funding Model for GSFC

Dr. Mona Kessel presented a lunch briefing on the Internal Scientist Funding Model (ISFM) that was to be applied across NASA, with most of the impact for heliophysics at the Goddard Space Flight Center (GSFC). Funding of civil servant (CS) scientists at NASA centers has evolved. Currently, their salaries are covered in a way that created some difficulties. Therefore, a project to address this began in late 2015; Dr. Kessel became involved in mid-2016. That year, the NASA administrator determined that there should be a new funding model. The success criteria were to include fewer proposals and more work that would enable NASA CS scientists to participate in panels and other activities. These scientists would still publish under the new construct, but they would receive their funding differently.

The initial committee included a member from each SMD division, a budget person, someone from the Office of the Chief Scientist (OCS), and a representative from each NASA center. The group met every other month, with weekly teleconferences, to develop an implementation plan. The broad plan that was ultimately approved is high level. The SMD divisions developed their own detailed implementation plans.

Not including the Jet Propulsion Lab (JPL), NASA has about 1,000 CS scientists, about 100 of whom work in heliophysics. Most of the heliophysics CS scientists are at GSFC, which also has scientists from the other NASA science disciplines (Astrophysics, Planetary, Earth Science). CS scientists serve as program and project scientists and work on all science-related tasks, as well as interfacing with the community, the press, and the public. NASA relies on them to provide a broad range of activities. Of the 1,000 CS scientists, about 150 full-time equivalents (FTEs) among about 350 individuals are funded

through competed R&A. The SMD divisions differ by percentage, with HPD having a higher proportion that compete for funding.

The ISFM committee decided that it was in best interest of NASA and the nation to support the CS scientists in a way that helps them realize their potential. Therefore, some portion of HPD R&A work will be reserved for competition among CS scientists working at NASA centers. There will be no change in the balance of funds going to the external community. Initially, these internal HPD competitions will be for the Heliophysics Supporting Research (HSR) and GI programs. There will also be some DRIVE funding set aside for internal competition. CS scientists will be allowed to be co-investigators (co-Is) on any proposal. That does not account for much funding, and there is no good way to track co-Is. Dr. Klimchuk, who works at GSFC, said that many CS scientists wanted the internal funding to be competed. They had also hoped for the changes to have no impact on the internal/external partnerships. Thirty percent of his budget goes to external people. Dr. Kessel said that that can continue, just as external funding can go to CS scientists as co-Is.

Dr. Kessel next described the various R&A programs within HPD. Almost 80 percent of the funding goes to the external community, and the Division wants to keep that stable. This formula will be applied to DRIVE. There are two current ISFM awards at GSFC that will use their existing HSR and HGI funding. The Marshall Space Flight Center (MSFC) has some CS scientists working on heliophysics, but they will not enter the ISFM competition right away. HPD is managing its ISFM work quite differently from the other SMD divisions. HPD hopes to establish four or five ISFM projects. The ISFM projects will all be peer-reviewed, and the teams will be able to compete for extensions in 3 years, with new internal teams eligible to compete as well. The external science community will review the NASA internal proposals, and NASA CS scientists will review external science proposals. Those CS scientists who are not funded under this scenario can still apply to the remaining HPD R&A programs.

Dr. Klimchuk said that he was initially uneasy with the concept, but he appreciates the underlying philosophy, which should work out well if executed as planned. He does not believe that it threatens funds for external scientists. Dr. Kessel agreed, noting that HPD will be tracking it. Dr. Klimchuk added that this will allow for better peer review panels with fewer conflicts, while resulting in fewer proposals.

Dr. Cassak said that it sounded good, but he was concerned with the balance of internal and external proposals judged “excellent” and wondered if there might be a way to compare them. Dr. Kessel replied that HPD does not have to allocate all of its R&A funds if there are not enough good proposals. This mechanism will also allow NASA to be more strategic in hiring. Dr. Ho asked about how the funding situation would affect hiring of postdocs. Dr. Kessel explained that there are multiple NASA sources for that, and HPD tries to bring postdocs into missions.

Dr. Lynn Kistler asked what would happen to a CS scientist who relied on R&A funding if that person did not succeed in the internal competition. Dr. Kessel said that there are other programs, as well as internal funding. Their management has to figure out how to pay for them anyway. She noted that the Astrophysics Division (APD) and Planetary Science Division (PSD) have negotiated directed, non-competed funding for the centers. They are watching HPD, however, as the Division is small and can serve as a pilot for SMD. She was not sure what the Earth Science Division (ESD) had planned.

Dr. Ho said that when he first heard of this via PSD, he was taken aback. However, he liked the HPD plan. He cautioned that the science community has rumors going around. Dr. Liemohn said that it would

be useful to have a finding that this is a reasonable plan, in order to share that feedback with the community. He and Dr. Ho agreed to write the finding.

Dr. Angelopoulos asked about what precipitated this effort and if there might be any guidance for betterment of the centers. Dr. Kessel said that there was a consensus that CS scientists spent too much time on proposals that were quite small. It began as a grassroots effort, then upper management at NASA decided to investigate ways to help the CS scientists be more effective.

Once the presentation and discussion were complete, Dr. Dahlburg said that she thought HPAC should write a letter on the SR review, which she would draft. Ms. Luce noted that she would provide additional budget information the next day.

Briefing on Heliophysics CubeSats

Dr. Dan Moses, Program Scientist for HPD's Explorer and Low-Cost Access to Space (LCAS) programs, explained that LCAS develops hardware, technology, and science, much of which involves sounding rockets and balloons. However, the program is doing more with the International Space Station (ISS) and cubesats. NASA began using cubesats for science in 2014 with the SMD Cubesat Initiative Panel (SCIP), hosted by HPD. The Heliophysics Technology & Development for Science (HTIDES) LCAS program element is now part of ROSES.

LCAS is now the entry program for the SCIP selections. The guidance comes from NPR 7120.8, which allows some failure as an element of experimentation. Dr. Moses discussed the launch schedule, noting that secondary payloads are subject to the delays of primary payloads, and sometimes sit for a while. The program is still working on this. In addition, the Kennedy Space Center (KSC) has a launch team to ensure that the secondary payload and spacecraft do not harm each other. HPD has been more assertive than other divisions in moving forward with cubesats. The 2016 Explorer program had openings for smallsats and cubesats, including the use of Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) rings, on both SMEX and MO competitions. On the Explorer MOs, cubesats are held to the 7120.5 Class D mission standards. There are issues and challenges here, such as the impact of the radiation environment on mission success.

Mr. Darko Filipi noted that while NASA missions have certain requirements, commercial missions are trying to push cubesats further. There is also an effort to try to deorbit cubesats as appropriate to keep them from interfering with other missions. The Department of Defense (DOD) and others are working on extending the cubesat lifetimes. Dr. Angelopoulos cited a push to fund some of this with the National Science Foundation (NSF). The price of cubesats is going up, as is the risk. He wondered what NSF/NASA collaborations might be possible. Dr. Moses agreed that there are challenges. The NSF leader in this area has moved on. As a result, while he would like to collaborate with NSF, he is not sure this is the right area at this time. NASA should retain its own programs and be realistic about success metrics.

A virtual institute at Ames Research Center (ARC) tracks all of the cubesat work across the Agency. When SCIP closes at the end of FY18, each division will have its own cubesat program. SMD then will have a SmallSat Working Group (SSWG) and the centers will come in via the SmallSat Coordination Group (SSCG). The SCIP experience of 11 HPD cubesat efforts will provide the basis for future direction within the Division. Lessons learned include that the effort should: continue new capabilities demonstrated under SCIP; correct erroneous assertions; become more realistic about budgets, which were often under-estimated and include a class that is much more costly than anticipated; right-size the

hardware development timelines, which were often underestimated and subject to schedule delays that defeated the rapid science and technology development; and adjust the LCAS proposal format to enable better determination of the likelihood of technical success.

In discussing the fact that cubesats may wait for a launch date, Dr. Moses explained that NASA prefers to design cubesats to sit if necessary. However, there are issues involved, including whether the students behind a project will still be in school when the project launches, for example. He also confirmed that a lot of effort is going into clarification of Class D standards. NASA needs to find ways to push the science at a rapid pace, but with a reduction in cost. High-risk missions are more palatable when the risk is identified in advance.

HPD wants HTIDES to have another component – small orbital missions – for cubesats and smallsats. The grant size of a typical investigation in the new element is typically $4.5 million, and up to $10 million for compelling investigations. Cubesats in the $2.5 million class will remain in LCAS, which is an annual call. The new missions conducted under NPR 7120.8 are still sub-orbital. In ROSES 2018, reviewers will look at small orbital mission proposals under a modified Explorer model. There will be a 4-month Phase A preceding a competitive down-selection. There will be more information at HPAC's next meeting, at which point Dr. Moses would like the Committee's feedback on the draft small orbital mission proposal scheme.

Briefing on HPD R&A Program

Dr. Talaat provided this briefing remotely. He began by showing the R&A Program's alignment with the DS. The success rate for the ROSES 16 selections was slightly above that of the previous year. He then showed the status of ROSES 17, most of which was still in progress. The R&A Program continues doing two-step proposals. DRIVE implementation starts in FY18 and is funded in the PBR. It will level off in FY20 after a total R&A Program increase of $65 million per year.

Planned elements for ROSES 17 and 18 include the Heliophysics DRIVE Science Centers, the Heliophysics Career Enhancement for New Technologists and Scientists effort, NASA/NSF opportunities in the computational aspects of space weather and coordination of ICON and GOLD, a NASA/NSF/NOAA pilot Operations-to-Research (O2R) activity, and a heliophysics/planetary joint Juno participating scientist program. Regarding the ICON launch delay, open opportunities must have both a GI program and data availability. GOLD will launch in January, with a 4.5-month transit and a few months of commissioning, so that it will be almost a year before the community has access to usable data. That will provide information on whether to delay this joint opportunity with NSF or do it differently than currently envisioned.

The early career program is not intended to duplicate the NSF program, and it does not have a similar faculty-development program. If NSF and NASA were to hold a joint call, the two agencies would make selections together, but weighting might differ according to their individual criteria. Dr. Larisa Goncharenko asked about plans for collaborative research beyond FY18, specifically noting SWAP. Dr. Talaat said that SWAP opportunities reflect the Plan's priorities. NASA would like to have interagency opportunities, and the computational aspects of space weather would be a pilot. Regarding O2R, the Agency wants to see if these efforts are successful enough to warrant future investment. One factor will be the NSF budget.

ROSES 17 has a tight timeline, though HPD still hopes to meet it. Some of the inter-agency agreements are taking longer than anticipated, and some of the international collaborations are further complicated. Dr. Goncharenko suggested finding ways to make international collaboration easier and more focused, like workshops and seminars. Dr. Talaat said he would like to get her ideas on this. He noted that collaborative opportunities allow NASA-funded awardees to apply for NSF computing assets. The science center funding comes out of the Grand Challenge Research (GCR) and Living with a Star (LWS) science. The NSF and NOAA collaborations come out of Space Weather Research. The HPD Juno participating scientist program with PSD is pending clarification from the project team regarding data availability.

Dr. Talaat reviewed the ROSES 16 LWS selections. The goal is to produce a clear plan of action at the outset of the Focused Science Topics (FST). He described the FST formulation process, which involved community input, review, ranking by HPS, and selection by HPD, which chose four. There have been some changes in the submission deadlines. There will be an LWS Program Analysis Group (LPAG) similar to the LWS Steering Committee. The PAGs will report to NASA and may brief HPAC. The MOWGs will be reconstituted as PAGs, though if HPAC wants a different focus, that is an option. Dr. Dahlburg said that there would be a preliminary finding in the letter.

Dr. Talaat said that the core science of LWS will continue, including through space weather opportunities. The LWS Institutes have been active; Dr. Talaat described a typical award. He then showed the framework for interagency operations, noting partnerships with Europe, Japan, Korea, and India on space weather, modeling, and other topics.

Community concerns are consistent across disciplines, funding agencies, and countries. Dr. Elliott said that some of the proposals are going to reviewers who lack relevant expertise, which causes difficulty. Dr. Talaat said that this occurs partly as a result of efforts to avoid conflicts of interest. HPD needs more reviewers in the system. Mail-in reviews generate mixed feelings and are treated as conflicted.

It was agreed to continue the discussion during lunch on the following day.

Public Comments

The meeting was opened for public comment. Dr. Vyacheslav (Slava) Lukin of NSF had sent an email for Dr. Klimchuk to read, in which he asked for clarification about the use of NASA computers. The response was that the discussion was about NASA people using outside computers, not others using NASA computers. A Big Data Task Force (BDTF) was working on this issue at NASA and HPAC will receive a briefing eventually.

Committee Work Session

Dr. Dahlburg reviewed the plans for the next day, and the small groups resumed work on GPRAMA.

Adjourn

The meeting was adjourned for the day at 5:02 p.m.

Friday, December 1

Briefing on HPD Science Centers

Dr. Kozyra explained that the DRIVE Science Centers (DSCs) are a work in progress, and HPD wants to do something innovative with them. This effort grew from the DS, which highlighted the centers as a way to move forward. The anticipated funding, which is currently in the Grand Challenges budget line, grows from $2 million in 2017 to $8 million in 2020. NSF will start contributing at some point. The DS recommendation is for center budgets of $2-3 million/year over 4-6 years. Renewals might be possible and space weather funding could come from LWS as an augmentation. In early 2018, there will be a solicitation for the program.

Dr. Kozyra described the planning inputs, which included 35 RFIs, as well as reports from NSF and the Committee on Solar and Space Physics (CSSP) at NAS. As NSF has a long history with centers, HPD looked at four of its center programs: the Centers for Chemical Innovation (CCI); the Materials Research Science and Engineering Centers (MRSEC); the Science and Technology Centers (STC); and the Physics Frontier Centers (PFC). HPD is also looking at the NASA Astrobiology Institute (NAI), which is entirely virtual. HPD compared the NSF centers by funding level, unique element, other grants, number of proposals allowed per PI/co-I, and who can submit. NASA might want to study some of the unique aspects, such as the chemical study development phase. The STC network is another unique aspect that has favorable responses. The main costs usually involve FTEs. The four centers differ in terms of leveraging grants from other sources.

Suggested categories for the DSCs include solar physics, AIM coupling, ion-neutral coupling, discovery using data analytics, basic plasma physics, space climate, space weather hazards, space weather related to the Sun-Earth system, and Sun-Heliosphere. There are many subcategories within these. The centers need to be “grand” but also focused.

Dr. Kozyra next reviewed the RFI recommendations in terms of personnel, resources needed, and cost/lifetime. The baseline number of researchers seems to be 8 to 10, along with students. Resources largely address computers, some of which could be stored at the centers. The cost range of $1-4 million annually assumes leveraging at the lower end. Data show that it is most effective to have all funded individuals work together even though they might not know each other. In terms of structure and management, the PI role is key.

The RFI resulted in concerns about R2O-O2R, the military/civilian element, and commercial partners and societal benefit. Most respondents felt like the investigators should be mostly co-located, with supplementary virtual team members. Dr. Kozyra noted that there was a sense that building infrastructure for space weather operations should be funded via other mechanisms. Dr. Elliott asked about the recommendation for face-to-face work, pointing out that modeling and data analysis are not done this way. Dr. Kozyra said that the RFI did not solicit this portion of the discussion. Rather, it was volunteered. Dr. Goncharenko said that after the team is established, members can go off and work on their own, but they should be together at first. Other issues raised in the RFIs were team integration, computational resources, center management, data analytics, and leveraging the host institution. Only two RFIs addressed the human element. There are also challenges, including diversity, size, boundaries, geographic dispersion, and others.

Dr. Kozyra presented notional proposal schemes for one- and two-phase centers. She also presented two funding timelines according to multiple and two-phase centers. Six questions under discussion address O2R-R2O components, the number of centers, the two-phase model and the shared resources model, proposal review site visits, the computational needs of multiple centers, and metrics for success. The

respondents emphasized the need to avoid paperwork. HPAC members were welcome to address the six questions via individual emails. They were also welcome to discuss the pros and cons of virtual work.

In discussion, Ms. Luce said that the O2R element might be partly funded through space weather or NOAA as part of the call, or it could be a special call. Dr. Kozyra added that NSF had not yet decided anything about this effort. HPD would be talking to them soon about their timeline and contribution.

Briefing on NASA HEC Status and High-Performance Computing Resources

Dr. Tsengdar Lee provided an update on HEC at NASA, beginning with a graph of use and projected growth for the HEC portfolio. SMD uses just over half of the supercomputing for the entire Agency, and the demand each year far exceeds capacity. The allocation within SMD is based on the 2006 investment among the divisions, in which HPD and PSD contributed the least. However, the science and the need for HEC are changing dramatically. HPD sought about 70 million Standard Billion Units (SBUs) for FY17, but the allocation was much lower than that, about 43.5 million. NASA's costs include everything, such as overhead, electricity, etc. This is cost-effective compared to other agencies, and vendors have said that when the Agency uses more than 35 percent of the system, NASA is more efficient and cost-effective than commercial alternatives. NASA owns its buildings and equipment.

HPD can purchase additional computing resources for periods of 3 years. Some of the requests cluster, creating inefficiencies. As equipment improves, the cost is dropping. For example, 4 million SBUs may cost $1 million this year but only $0.75 million next year. All SMD divisions were oversubscribed, and the programs are changing shape. NASA is addressing the allocation issue and taking certain events or surge periods into account. For example, around the time of the 2017 solar eclipse, a dedicated machine provided simulations for a week, which worked quite well. In another example, a PI sought the help of NASA engineers in modernizing code for a particle magnetosphere model, resulting in improved performance by a factor of four. To mitigate the growing need, NASA is building a modular HEC facility at ARC to allow future expansion. This work had been going on since 2016 and capacity has already expanded as a result. Facility expansion will allow many more equipment containers, and the goal is to build capacity for the future. NASA hopes to increase the capacity of engineering to assist users, as well. Dr. Lee noted that while software engineers can provide help, NASA cannot dedicate them to a project.

SMD plans to continue increasing capacity, partly by tying HEC resource needs to the budget planning process. This means it will need to be considered in proposal evaluation and award processes in order to identify the call for resources above the baseline. SMD can use advocacy help for more HEC investment at the Directorate level. It would also help to document the needs through various reports, including committee recommendations, NAS studies, etc. Dr. Lee added that SMD has about 150 million SBUs per year. Memory is a limitation, and very expensive. Dr. Dalhburg asked him to come to the next HPAC meeting to discuss how the Committee can best help and how to document heliophysics needs.

Committee Work Session

HPAC resumed the GPRAMA discussion. Dr. Miralles presented the summary from the group for API 17.1, which addressed planned progress in exploring physical processes. The group determined that NASA supported new breakthroughs in this area and had significant achievements in elucidating key physical processes that affect our understanding of the environment of the Sun and the solar system. The first example was the SOHO observation that the core of the Sun rotates rapidly. Second was the physics of magnetic fields explosively releasing energy, as measured by MMS. The third example concerned hot hydrogen in the upper atmosphere.

Dr. Dahlburg called for a vote on the color rating. It was unanimous for green.

Dr. Angelopoulos headed the group for API 17.2, about advancing connections linking the Sun, Earth, planetary space environments, and the outer reaches of the solar system. The first example was about how the Sun accelerates solar winds and the interactions of those winds with the local interstellar medium. Second was an example explaining new insights from the HSO on how the solar wind drives the dynamics of the radiation belt. The third example discussed lower atmosphere waves invading the upper atmosphere. A fourth example cited the discovery that solar heating of the thermosphere was constant over several solar cycles.

Dr. Dahlburg called for a vote on the color rating. It was unanimous for green.

For API 17.3, to detect and predict conditions in space, Dr. Liemohn presented four examples. The first was about tracking CMEs from the Sun to the edge of the heliosphere. The second noted that new, faster warnings of dramatic solar storms can prevent harm. The third concerned solar cycle disturbance events and quantifying extreme events. The final example was about how extreme terrestrial disturbances shake up the near-Earth space.

Dr. Dahlburg called for a vote on the color rating. It was unanimous for green.

HPAC next discussed SMD's charge to the R&A advisory committees regarding high-risk/high-reward (HRR) research. APAC had already discussed it, and the APAC chair provided input to the Science Committee. The other committees have not yet weighed in, though it was noted that the PSD director looks at bimodal contributions in the proposal process to see if they are HRR. The Science Committee discussed whether this might be a good first pass. One Science Committee issue is not creating extra work for NASA staff.

Dr. Michael New, the Acting Deputy Associate Administrator for Research in SMD, joined the discussion in advance of his presentation on HRR research. He suggested that HPAC not immediately dive into a detailed study of HPD R&A processes, as he planned to compare division practices and identify those that are most successful. Dr. Thomas Zurbuchen, SMD Associate Administrator, was seeking interim tactical advice and an initial impression. SMD will decide on the next steps. The thinking was that the advisory committees would address HRR in a two-meeting cycle. Dr. New confirmed that HPAC could form a subcommittee for non-FACA discussions as long as the subcommittee does not include all HPAC members, and provided it does not formulate recommendations that will simply be rubber-stamped. If all of the SMD divisions present similar options, there will be no need for an inter-division committee, but such a committee would be an option if a wide range of options results.

R&A Program Study Charge to Advisory Committees

Dr. New presented two questions that SMD hoped to answer. First, does the SMD R&A program have effective processes in place to solicit, review, and select HRR projects? Second, does the SMD R&A program have effective processes in place to solicit, review, and select focused, interdisciplinary, and interdivisional projects? The current process involves standard panel reviews and information from the panels about HRR proposals. If HPAC were to recommend changes, SMD would like thoughts on the design, as well as the balance between HRR and more standard science. There are many subquestions, some of which address interdisciplinary and inter-divisional research.

Dr. Angelopoulos was unaware of a process for selecting HRR proposals. Dr. New agreed that there is no formal process at the moment. It is ad hoc, which is why SMD hoped to address the issue more systematically. So far, he only sees anecdotal evidence indicating that medium-to-high impact and medium-to-low intellectual risk proposals receive the highest ratings in review. Program officers can look at intellectually risky proposals, however. He wanted input on the "how" rather than the "why." The advice should address tactics, not strategy. He also wanted the Committee to address each subquestion, and to provide thoughts, ideas, and advice. He offered to provide materials that might help. The working definitions are based on what is already in use. HPAC was free to alter the definitions as needed. "High-risk" is really high intellectual risk, encompassing novel hypotheses with scant precedent or preliminary data, or those that run counter to existing scientific consensus. "Multi-disciplinary" is like fruit salad, while "inter-disciplinary" is like a fruit smoothie.

Mr. Filipi suggested incorporating an aspect of cost that might tie into smallsats. Dr. Dahlburg agreed, adding that sometimes a low-cost proposal will be tossed out because it is not seen as realistic, when in fact it is innovative. Dr. Elliott observed that panels are not asked to evaluate risk and risk mitigation in proposals. One of her colleagues tried it and got a high score, while another tried and got a low score. Dr. New said that his experience has been that panels usually see discussion of mitigation as a strength.

Dr. Tomoko Matsuo asked if there might be a special call for HRR. Dr. New replied that that could be a recommendation. Dr. Dahlburg explained that the Science Committee determined that the community may dislike the reallocation of funds. There would also be questions about implementation. Dr. Liemohn wondered about having an RFI, which Dr. New said could be a recommendation. He added that APD and PSD have joint programs for exoplanet research and habitable worlds. Those divisions would like to bring HPD into either or both. The Nexus for Exoplanet System Science (NExSS) pilot program has been successful in leveraging research as well. Dr. Angelopoulos saw a lot of excitement in this area, and noted that cutting-edge research often comes from such interfaces. Ms. Luce reminded HPAC that HPD anticipates increases in the R&A budget with DRIVE, and asked them to consider whether to allocate some of those increases to this kind of work.

Dr. Dahlburg said that HPAC could go in two directions. They could follow APAC's example of sending thoughts to the chair. As an alternative, they could have a subcommittee address the issue and report to HPAC. The vote was unanimous in favor of a subcommittee.

Drs. Klimchuk and Cassak agreed to co-chair the subcommittee, which would gather information from the community and provide a range of options for recommendations. HPAC will need time to discuss this at the next meeting. Members could self-select as long as not everyone joined. Dr. Dahlburg asked that interested members let the chairs and Dr. Kozyra know of their interest in next few days. She cautioned against turning this into a de facto HPAC meeting or discussion.

Briefing on HPD R&A Program, continued

Dr. Talaat resumed his discussion of community feedback on the HPD R&A program. One concern is what appears to be randomness in the selection process and little consistency between panels. A potential solution is to increase the number of reviewers per proposal on the panels, while also better matching expertise to proposals. Mail-in reviews get mixed feedback. Both HPS and CSSP had recommended increasing staff on the panels. HPD has added program scientists to help with this as well. Dr. Ho said that his experience has been that PSD is more rigorous in organizing panels, while HPD is less so. Dr.

Talaat agreed, stating that this matches an internal assessment. HPD has been assessing its non-documented practices.

Dr. Matsuo said that the summary of comments that comes after the mail-in reviews does not provide a sense of what actually happened at the panel. Dr. Klimchuk thought that the feedback was often useful. Dr. Cassak asked if reviewers can come from outside the United States. Dr. Talaat replied that there are no citizenship or institutional restrictions on panelists. The mail-in reviews are treated as information only. There is a distinction between using conflicted mail-in reviewers versus those not associated with proposals. Dr. Ho said that PSD panelists do some self-assignment regarding expertise, and Dr. Goncharenko observed that short timelines are problematic. Dr. Talaat said that CSSP provided similar feedback about increasing the lead time. They advised giving notice as to when the panels might be held. HPD cannot divulge exactly when they take place, but the Division can give the time of year to alert potential reviewers. In a discussion of teleconference panels, it was noted that while they alleviate travel burdens, attention can drift and dominant personalities sometimes take over. Dr. Talaat added that there was concern about escalating small points to major weaknesses and missing major strengths and weaknesses. To address this, HPD will encourage debriefing, try to increase community participation, and stay on top of cognitive bias research concerning peer review panels.

The low success rates will be addressed to some extent with DRIVE. Dr. Cassak observed that continued success will require more than a new chunk of funding. There was discussion of whether to discourage repeat proposals, or set criteria for changing such proposals, but Dr. Talaat pointed out that this would require a policy change by NASA, which currently assumes all proposals to be new. Dr. Dahlburg said that the National Institutes of Health (NIH) takes a different approach, with both positive and negative consequences. This might be something for HPAC to discuss in the future.

In response to HPD questions, CSSP advised having more rigor in vetting reviews, letting proposers know if they were competitive, evaluating the effectiveness of mail-in reviews, providing advanced notice for planning, encouraging diversity in the PI grant programs and flight missions, and determining whether a feedback process could be implemented in the review process. Regarding diversity, this is an issue across several axes, including gender and under-represented minority groups. HPD does not track age data, which, like gender data, cannot be requested. Gender is often guessed, however. For example, it was clear that the SMEX proposers were all men.

Dr. Elliott observed that the age of the heliospheric community is quite high. NASA needs to bring in younger scientists or risk losing the field. Ms. Luce said that the community can help promote early career scientists, but it is not clear how NASA can encourage them. Dr. Dahlburg said that smallsats can offer good opportunities, but Drs. Matsuo and Goncharenko remained concerned about gender balance. Dr. Dahlburg suggested this as a subject for further discussion. She noted that this was a very compact meeting, and they were generating topics for the next meeting. Dr. Talaat said that he would welcome that, as he planned the presentation to set up future discussion.

Dr. Liemohn cited a communications issue behind the scenes in the heliophysics community. He said it was frustrating, as HPAC, and HPS before it, had discussed these issues. He was also irked that people who knew him did not reach out to him as a member of HPS/HPAC. He felt that HPAC should strive to keep the community better informed of its activities, and review how that is done. Dr. Dahlburg said that while HPAC information is published, other agencies have a different dynamic. She hoped that HPAC, being now FACA, would change things. Dr. Klimchuk observed that the MOWGs enabled two-way

communication. Dr. Talaat said that any feedback about HPD R&A would be welcome regarding whether the Division is missing some concerns, the relative weighting or assessment of concerns, etc. The letter Dr. Liemohn referred to was not representative. Dr. Liemohn explained that part of his frustration came from the fact that some of the work was already being done.

Committee Work Session

Dr. Dahlburg led the review of topics for the briefing and letter to Ms. Luce. First, HPAC voted for green ratings on all three of the GPRAMA APIs. Drs. Miralles, Angelopoulos, and Liemohn would read their summaries in the out-briefing. Those summaries would go into the letter. Second, there was a presentation on the recent HPD SR, which evaluated 16 missions. HPAC accepted the report unanimously. A signed letter will follow. Third was to be a commendation to HPD for its work on the ISFM effort.

For Dr. Moses' briefing on cubesats and smallsats, Dr. Angelopoulos drafted some findings and recommendations, which included praise for SMD being proactive in this area. The first recommendation was to follow the best practices of Explorers in programmatic aspects. He suggested that funding should come through Wallops to ensure timely monitoring of grant and engineering help. Contractual delays could kill a program otherwise. There was a second recommendation dealing with the Small Orbital Mission process for rocket review, and a third recommendation was that there be some funding set aside for smaller organizations, as NASA centers and academic organizations will come to dominate otherwise. Dr. Dahlburg advised stating that the small group discussed these, rather than all of HPAC, and there will be further consideration at the next HPAC meeting. Dr. Liemohn added that it might work better to change the third recommendation to state that HPD should consider assessment of a firewall, since that was not an HPAC discussion. Dr. Angelopoulos agreed to make those changes.

HPAC agreed to thank Dr. Talaat for his R&A presentation, but hold off on further comment since they expected to have a more in-depth conversation at the next meeting. Dr. Klimchuk said that HPD and HPAC need PAGs, which are similar to the MOWGs of the past, in order to bring in the community more strongly and to focus more finely. Dr. Dahlburg agreed that HPAC should address this. The PAGs will talk to HPAC, but they will report to HPD. She would also say that HPAC is encouraged to provide feedback to Drs. Talaat and Kozyra in advance of the next meeting.

The briefing and letter would also state that Dr. Kozyra's presentation on the HSCs was helpful, and that HPAC members would be sending her feedback. Dr. Lee provided an update on HEC, which should be treated as a limited resource. HPAC will address this further at the next meeting. Finally, Dr. New provided the R&A charge. An HPAC subcommittee on HRR will address data collection and provide a report to the Committee 2 weeks prior to the next HPAC meeting. The letter would also thank those who provided meeting support.

HPAC Outbrief to HPD Director

HPAC presented the highlights of the letter, as discussed above. Regarding the cubesat briefing from Dr. Moses, Dr. Angelopoulos added that some see the Small Orbital Mission process used at the Wallops facility as more appropriate than the process used at the Langley Research Center. Cubesats and smallsats are a means of training at some universities, and some within HPAC want to preserve that. This will be discussed at the next HPAC meeting. Dr. Klimchuk, in discussing Dr. Talaat's R&A update, pointed out that HPD needs to pull in more community involvement via something like the MOWGs. He suggested they be organized by discipline. Otherwise, the letter followed the discussion from the previous work session.

Ms. Luce addressed an action item, to provide more detail on the budget, which she did by presenting a graph of the topline HPD PBRs of FY15-18. The trend is upwards. Many other parts of the Federal government and even within NASA were flat. This is mostly via DRIVE. She noted that this was not a case of a program from elsewhere transferring to HPD along with its funding.

Ms. Luce added that this was an inspiring and encouraging meeting, and she was very impressed with how the new members contributed. By the next HPAC meeting, which could be in March, there should be a new division director. GOLD will have launched by then, and HPD should have a launch date for ICON. She appreciated the conversations about ways in which HPD can improve R&A.

Adjourn

The meeting was adjourned at 2:25 p.m.

Appendix A
Attendees

Heliophysics Advisory Committee members
Jill P. Dahlburg, Naval Research Laboratory, Co-Chair
Michael W. Liemohn, University of Michigan, Co-Chair
Vassilis Angelopoulos, UCLA
Paul Cassak, West Virginia University
Heather A. Elliott, Southwest Research Institute
Darko Filipi, Adcole Maryland Aerospace
Larisa Goncharenko, MIT Haystack Observatory
George Ho, Applied Physics Lab
Lynn Kistler, University of New Hampshire
James Klimchuk, NASA Goddard Space Flight Center
Tomoko Matsuo, University of Colorado Boulder
Mari Paz Miralles, Smithsonian Astrophysical Observatory
Cora Randall, University of Colorado Boulder
Roger W. Smith, University of Alaska (via telecon)
Janet Kozyra, NASA HQ, *Acting Executive Secretary*

NASA Attendees
T. Jens Feeley
Roshanak Hakimzadeh
Jeffrey Hayes
John Karcz
Jennifer Kearns
Mona Kessel
Tsengdar Lee
Peg Luce, Acting HPD Director
J. Daniel Moses
Michael New
Jim Spann
Katya Verner
Alan Zide

Other Attendees
Lamont DiBiasi, Southwest Research Inst.
Heather Futrell, Booz Allen
Adam Gnazzaui, Booz Allen
Sam Haine, Booz Allen
Chuck Holmes, BDTF
Ben Kallen, Lewis-Burke Associates
Elizabeth Sheley, Ingenicomm

Remote Attendees
Robin Colaninno, NRL
Maura Hagan, Utah State University

Jamison Hawkins, Lockheed Martin
Russell Howard, Naval Research Lab
Ben Kallen, Lewis-Burke Associates
Mark Linton, NRL
Slava Lukin, NSF
Steve Mackwell, USRA
Simon Plunkett, Naval Research Lab
Martin Ruzek, USRA
Bernard Shelton, NASA
Claudo Walkin, NSA
Nicholas White, USRA
Ashley Wilson, American National

Appendix B
Advisory Committee Membership

Jill P. Dahlburg, Co-Chair
Naval Research laboratory

Michael W. Liemohn, Co-Chair
University of Michigan

Elsayed Talaat (Executive Secretary)
NASA HQ

Janet Kozyra (Acting Executive Secretary)
NASA HQ

Vassilis Angelopoulos
UCLA

Paul Cassak
West Virginia University

Bart W. De Pontieu
Lockheed Martin

Heather Elliott
Southwest Research Institute

Darko Filipi
Adcole Maryland Aerospace

Larisa Goncharenko
MIT Haystack Observatory

George Ho
Applied Physics Lab

Lynn Kistler
University of New Hampshire

James Klimchuk
NASA Goddard Space Flight Center

Tomoko Matsuo
University of Colorado Boulder

William Matthaeus
University of Delaware

Mari Paz Miralles
Smithsonian Astrophysical Observatory

Cora Randall
University of Colorado Boulder

Roger Wilford Smith
University of Alaska – Fairbanks

Appendix C
Presentations

1. *Heliophysics Division Overview*, Peg Luce
2. *FY17 Heliophysics Science Performance Assessment (GPRAMA)*, Jennifer Kearns
3. *Heliophysics Senior Review Briefing to HPAC*, Jim Spann, Jeff Hayes
4. *Heliophysics Internal Scientist Funding Model*, Mona Kessel
5. *CubeSats in the Heliophysics Division Flight Program*, Dan Moses
6. *NASA R&A Update*, Elsayed Talaat
7. *Drive Science Centers: Issues & Implementation,* Janet Kozyra
8. *State of NASA High End Computing Capability Project and its Support of Heliophysics*, Tsengdar Lee
9. *R&A Charge to SMD Advisory Committees*, Michael New

Appendix D
Agenda

Heliophysics Advisory Committee (HPAC) Meeting
NASA Headquarters, Washington, DC
November 29 – December 1, 2017

Wednesday November 29, Afternoon, Room 5H41 (MIC5)		
14:00	Welcome, Overview of Agenda	Jill Dahlburg, HPAC Chair
14:15	Heliophysics Division Overview	Peg Luce, NASA HQ
15:15	**BREAK**	
15:30	Preliminary discussion of GPRAMA process	Jennifer Kearns, NASA HQ
16:30	Committee work session on GPRAMA	
17:00	ADJOURN	

Thursday, November 30, Room 7H41 (MIC7)		
9:00	Briefing on Senior Review	Jim Spann and Jeff Hayes, NASA HQ
10:30	**BREAK**	
10:45	Committee Work Session	
12:00	**LUNCH – Briefing, Internal Funding Model for GSFC**	**Mona Kessel, NASA HQ**
13:00	Briefing on Heliophysics CubeSats	Dan Moses, NASA HQ
14:00	**BREAK**	
14:15	Committee Work Session	
17:00	ADJOURN	

Friday, December 1, Room 5H41 (MIC5)		
9:00	Briefing on HPD Science Centers	Janet Kozyra, NASA HQ
9:30	Briefing on NASA SEC status & high-performance computing resources	Tsengdar Lee, NASA HQ
10:15	**BREAK**	
10:30	Briefing on the HPD R&A Program	Elsayed Talaat via telecom
11:15	R&A program study charge to advisory committees	Michael New, NASA HQ
12:00	**Lunch**	
13:00	Committee work session	
14:00	HPAC outbrief to HPD Director	Peg Luce, NASA HQ
14:45	ADJOURN	