2018 Geospace Sciences COV Report

1. Introduction

This report is a summary of the Committee of Visitors (COV) independent assessment of the Geospace Sciences (GS) Section of the National Science Foundation (NSF) held May 2, 3 2018 at NSF. As requested, the COV committee reviewed NSF documents to evaluate the quality, effectiveness and integrity of the Section's use of merit review process. We examined the selection of reviewers, execution of panels, rationale for decisions and communication of results back to the proposer and to the community in general. We also studied the Section's jackets and questioned the Program Officers to assess the overall management of the GS program. This report contains an overall assessment of the Section and individual assessments of five sub areas: Aeronomy (AER); Magnetospheres (MAG); Solar-Terrestrial Relations (STR); Space Weather (SWx) and Ground-based Facilities (GF). Overall, the COV was highly impressed with the dedication of the GS staff as evidenced by the work of the past four years and the visible effort that went into preparation for this COV. It was clear from our examinations that the Section is highly competent, professional, and motivated, with a broad-base of scientific experience well suited to the diverse disciplines of the GS Program. We commend the Section Program Officers and staff for an effectively run program that serves the scientific community well and we appreciate the effort that went into preparing for this COV. This report contains a summary of our findings with specific recommendations.

2. Outline of the Assessment Process

The GS Section assembled a COV of nine with two representatives from each sub-area except Space Weather which only had one member:

Member	Institution/Organization	Sub-Area
Robert McCoy*	University of Alaska Fairbanks	Aeronomy/Facilities
Matthew Zettergren	Embry-Riddle	Facilities
Richard Wolf	Rice U/Dept of Physics and Astronomy	Magnetospheres
Mona Kessel	NASA/GSFC	Magnetospheres
Judith Lean	NRL	Solar Terrestrial
William Bristow	University of Alaska Fairbanks	Space Weather
Susan Nossal	University of Wisconsin	Aeronomy
Fabrizio Sassi	NRL	Aeronomy
Douglas Biesecker	NOAA/SWPC	Solar Terrestrial

*COV Chair

The members of the COV were briefed ahead of time by phone and after completing Conflict of Interest forms were given access to the eJacket system. Additionally, the Section preselected a random sampling of eJackets across all GS subareas for easy review by the COV, but access to all eJackets was provided. In all the COV accessed and reviewed about 200 eJackets before and during the review. On the first day of the review the COV was welcomed by the Division of Atmospheric and Geospace Sciences (AGS) Head, Paul Shepson, who explained a little of the process and outlined the importance of the COV to the Foundation. The COV was then briefed by the Section Program Officers including:

Mike Wiltberger	Section Head
Ilia Roussev	Solar Terrestrial
Ruth Lieberman	Aeronomy
Carrie Black	Magnetospheres
Irfan Azeem	Space Weather
John Meriwether	Facilities

Also in attendance was Sunanda Basu who provided expert advice on the history of the COV process.

After the presentation and lengthy period of questions by the COV members, the COV began developing independent reviews of each sub-area and a consensus review.

3. Summary of findings and recommendations

The overall impression of this COV is that the GS Section has been doing an outstanding job with the program in spite of the fact that this is a team in transition, i.e. most of the Program Officers are new to the program and the team has recently been handed a comprehensive (and multiply vetted) Portfolio Review (PR) which the team is aggressively working to interpret, socialize and implement. With two exceptions (Ilia Roussev and Sunanda Basu) the GS team has not been on the job for very long. Most of the team have had to learn their tradecraft rapidly in an environment with significant uncertainty in funding levels and funding availability. Most of the GS Program Officers (PO) had recently inherited their program with limited mortgage headroom and often inherited promises made by their predecessors. Even with these challenges every PO had already made significant progress in reducing their mortgage balances and freeing funds for new initiatives, and all demonstrated a determination to continue this trend into the future.

Conflicts of Interest

It appears that procedures for management of Conflict of Interest (COI) have changed significantly over the past five years resulting in additional challenges for the Section. In particular, the automated process of COI identification frequently made it harder for POs to build COI-free panels. Even for this COV the Section struggled to find nine COI-free panelists. Another disadvantage of the increased emphasis on COI is that for programs with small numbers of awards, like Facilities, the POs were significantly impacted in their ability to manage their programs. For example, a PI who generates data from a facility (or similar) instrument and shares it freely with the community is unwittingly creating conflicts with every person the data is shared with. For a small community like Geospace, which is becoming increasingly collaborative, it will be increasingly difficult for the Section to manage COIs in the future and they need to be afforded increased flexibility. This issue was flagged by the 2014 COV as a significant issue. At the time a new automated process had been implemented and the full impact had yet to be felt. The COV recommends that the Section undertake an effort to evaluate options that would satisfy the intent of COI restrictions while enabling Program Officers to do their jobs effectively. One suggestion would be to allow Program Officers and reviewers to self-report the nature of collaborations to prevent perceived COIs, when in fact, none exists.

Review Types

The COV studied Section jackets to assess the effectiveness of review processes. The Section made effective use of three review types: ad hoc (mail-in) reviews; in-person panels; and virtual panels. All three have well-known strengths and weaknesses. The mail-in reviews were typically less rigorous and showed a wider variation in review scores. The use of mail-in reviews in conjunction with panels was often used effectively to supplement expertise on the panel. The Section discussed an increased use of virtual over in-person panels. The benefits are numerous including increased participation (especially for panelists busy with academic, programmatic and family responsibilities), and significant savings in cost and time. The COV encourages the continued use of virtual panels where appropriate as a way of increasing participation and reducing travel burden on panel members. Virtual panels cost less freeing up funding for research grants. The COV agreed that in-person panels are the best way of conducting certain types of reviews (the COV itself being an example) and may lead to a more uniform set of recommendations and summaries to the program officers. In-person panels reach a consensus more quickly and generate more panelist interactions than their virtual counterparts. The recommendation of the COV is that while shifting to virtual panels has benefits, the other two forms of review are still of value and should be used from time to time as necessary. Overall, the COV found that the Section made effective use of all three types of reviews and that the review analyses from the panels was thorough and effective. The COV recommends considering redacting the names of reviewers and other sensitive information and sending the review analysis to the PIs for their benefit.

CubeSats

The NSF CubeSat program has become an important part of the portfolio and has enormous potential to benefit space science while training the next generation of space scientists. Both the 2014 GS COV and the Portfolio Review commended the Section on the CubeSat program and made recommendations to collaborate with other NSF Directorates (Engineering and Education) to enhance the science and education productivity of the program. This COV echoes these recommendations as a way to enhance and strengthen the program. There have been questions about the scientific return of the program. As more CubeSats are launched the scientific benefit (or not) of the program should be more obvious. By the time of the next COV the Section will have supported several more Cubesats and and the overall scientific impact of the program should be obvious. We recommend that the next COV review the scientific impact of the CubeSat program.

Broader Impacts

The 2014 COV recommended quantifying the value of Broader Impacts (BI) to their program. This COV recommends expanded efforts to educate the scientific community about the nature and variety of ongoing and emerging BI and about the NSF expectations for BI. The NSF program officers' presentations to the COV on May 2 were very informative. The COV recommends finding ways to communicate this information to a wider audience at meetings and elsewhere such as webinars. These presentations could educate the community on programmatics, funding opportunities and provide mentoring regarding best practices for proposals. Examples of such practices could include research questions and sample data or modeling results, and could illustrate ways to place the work

in the context of broader research field. An additional suggestion from the COV is for the Section hold to hold 'town halls' at conferences to educate the community on the proposal and review process. This would benefit not only students and early career scientists but mid- and late-career scientists as well. Consistency in proposals and reviews would benefit everyone, make leveling more straightforward, and help increase diversity. Such communication is particularly timely as targeted programs in the Section no longer have proposal deadlines. To be able to reach the broadest audience, the COV recommends that this communication be done in several venues, including written messages to the community, at conferences, and potentially webinars that can then be posted online for later viewing.

Support for Space Weather Mandate

Space Weather currently has high visibility on a national level as evidenced by the development of a National Space Weather Strategy and National Space Weather Action Plan (NSWAP). The initiative originated in the previous administration, and it is notable that this program has carried forward into the current administration. There is an important role for NSF to play in support of a proven national need. Many space weather operational sensors and models had their origin in NSF sponsored research. The COV recommends that NSF seriously consider providing additional funds to the Section to allow it to take advantage of this once in a generation opportunity to contribute to a national priority.

FDSS Flexibility

The COV applauds the FDSS program as an example of forward thinking to ensure the vitality of the discipline in the future. The COV recommends that the program consider additional low cost options in support of this initiative. One example would be to cover start-up packages as an additional means to help universities create new faculty members in Geospace Science.

Balance in Career Stage Support

As inflation-corrected funding rates and proposal success rates have trended down in recent years, some geospace scientists with ten or more years of experience have been forced to leave either the field or the United States. Perhaps some consideration should be given to the balance between, on the one hand, programs to attract new students and establish new Ph.D.-producing tenure-track professorships, and, on the other hand, efforts to help mid-career scientists stay in the field. A first step might be to gather information on the rate at which mid-career scientists are being forced out, to supplement existing anecdotal information.

COV Duration

The 2014 COV was satisfied with a three-day COV. With better access to eJackets ahead of the actual meeting for the 2018 it was decided to reduce the time to 1 ½ days. In principle this is enough time to complete the COV, especially if the COV members are familiar with the program and the COV process. This COV recommends a little more time - an extra day would have been useful. The first day of NSF presentations were highly enlightening and spawned much discussion within the COV.

Diversity

The program officers presented thoughtful and informative presentations with much attention to diversity issues. The Section has put an emphasis on inclusion of women in the review process and is working to generate more awards to women. In particular we note that both of the two new FDSS awards were to women. As a way to increase diversity we recommend that NSF Program Officers continue to develop ways to provide mentoring regarding writing and reviewing proposals to a broad audience. Some ideas to do so include communicating best practices for writing and reviewing proposals in several venues, including written messages to the community, at conferences, and potentially through a webinar that can then be posted online for later viewing. An additional way to invite community members to learn more about the proposal writing and reviewing process is to have the NSF Program Officers consider holding "office hours" during some lunch times during CEDAR, GEM, and SHINE.

INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?

Yes – for the most part. Reviews were a mix of panel, mail-in, and increasingly, virtual (BlueJeans) panels. RAPIDs by their nature do not require outside review. The types of reviews seemed entirely appropriate for each area. The previous COV noted that "in-person panels yielded the clearest guidance to NSF, and provided additional…tangible benefits to the community." While this COV recognizes the increasing benefits and cost savings of virtual panels, the COV recommends that the Section continue to include in-person panels when appropriate so as not to lose these additional benefits.

2. Are both merit review criteria addressed?

a) In individual reviews?

Yes, for the most part the individual reviews do address both criteria, though were occasional cases where this was not true. For example, one mail-in review gave fairly extensive review of the Intellectual Merit, while under Broader Impacts it said simply "The data from SuperMAG network has been contributing a lot for student training." It was noted that mail-in reviews do not always provide the most beneficial review but are often important to include opinions from reviewers with diverse experience.

b) In panel summaries?

Yes to a high degree. All of the panel summaries reviewed addressed both criteria, though with varying emphasis.

c) In Program Officer review analyses?

Yes. All of the PO analyses addressed both criteria.

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?

Yes for the most part. Nearly all of the reviews were substantive and provided adequate justification for the proposal rankings. There were a few exceptions to this where rather low rankings were given although no substantial weaknesses were cited in the review. In some cases the reviews were very brief with little justification given.

4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?

Yes. All of the panel summaries provided a thorough explanation of the ratings with clear reasons cited in both the Intellectual Merit, and the Broader Impacts. We found an example of a situation where the panel summary conflicted with the reviews. In that case the reviews were more critical than the summary. That proposal was submitted for consideration under EPSCOR and was eventually funded.

5. Does the documentation in the jacket provide the rationale for the award/decline decision?

Yes for the most part. As discussed above the review types were appropriate to the proposals, and the reviews were for the most part comprehensive and consistent with the ratings. In nearly every case the PO review analysis matched the reviews and summaries. In some cases the review analysis came to a final recommendation that differed from the panel consensus and supported a proposal that was not in the competitive range. Usually, there were other factors that the PO cited and the difference was justified.

6. Does the documentation to the PI provide the rationale for the award/decline decision?

Yes. In almost all cases the appropriate rationale was provided.

7. Additional comments on the quality and effectiveness of the program's use of merit review process:

Overall the GS Section's use of the merit review process was excellent. The review methods were appropriate and they were applied consistently.

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

1. Did the program make use of reviewers having appropriate expertise and/or qualifications?

Yes. The panels appeared to have a good mix of reviewers.

2. Did the program recognize and resolve conflicts of interest when appropriate?

Yes. The COV did not find any instance where this was not the case.

3. Additional comments on reviewer selection:

As noted above, the current COI process is making reviewer selection more difficult than it should be.

III. MANAGEMENT OF THE PROGRAM UNDER REVIEW

1. Management of the program. Please address qualities such as timeliness in making decisions and program mortgages.

Management of the program appears to be excellent. The time for decisions ranged from less than a month (RAPID) to in one case about 2 years. For the most part, the decisions were within a year. The cases where there was a longer timeline were where funding from other sources (EPSCOR, NASA) was sought.

2. Responsiveness of the program to emerging research and education opportunities.

An excellent example is the NSF CubeSat program which illustrates a specific focus on emerging research and education opportunities. NSF Geospace originated the program at a time when NASA and other agencies did not recognize the value of these satellites. Since then, these other agencies have come around and now have their own programs. Further, the program has always emphasized student participation in all aspects of the missions, which has provided outstanding opportunities for education in both science and engineering. The Space Weather program is another example of leadership from the Section supporting a program with excellent basic research components and strong applications to a national priority.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Program planning and prioritization processes that guided the portfolio seem to be appropriate.

4. Responsiveness of program to previous COV comments and recommendations.

For every recommendation from the 2014 COV, the GS Section demonstrated an honest effort to comply with the recommendations. Good examples include execution of the Portfolio Review and increased emphasis on the FDSS program. The previous COV complained about difficulties of access to eJackets. The current COV had no difficulties with eJacket access.

FY 2017 REPORT TEMPLATE FOR NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: May 2 -3, 2018
Program/Cluster/Section: Aeronomy
Division: Atmosphere and Geospace Sciences
Directorate: Geosciences
Number of actions reviewed: **Awards:** 13 **Declinations:** 16 **Other:** 1
Total number of actions within Program/Cluster/Division during period under review: **Awards:** 140 **Declinations:** 187 **Other:** 24
Manner in which reviewed actions were selected: A random sample of 5% of award, decline and other actions along with a selection of additional jackets where provided to the committee for their review. The committee was also provided with the complete list of all actions taken during 2014-2017 period.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question**.**

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? Comments: - Yes. The virtual panels are very effective, less time consuming, less expensive for the Foundation, and environmentally friendly. The adoption of web interfaces that allow panelists to see each other via web cams is a welcome novelty. Some caution though: some Federal employees are not allowed to use web interfaces that require a camera in their offices, nor on any GFE. This may be a potential limitation. One possible remedy is to send the slides as a pdf ahead of the virtual meeting and give an option for participating by phone. - We encourage the use of virtual panels and continuing to develop ways to increase their effectiveness and help participants to interact well with one another. Virtual panels can be easier for participants to fit into their schedules. Additionally, with the urgency of climate change, the use of virtual panels can avoid the greenhouse gas emissions associated with travel. The money saved can also be then used to support additional science projects.	Yes
2. Are both merit review criteria addressed a) In individual reviews? b) In panel summaries? c) In Program Officer review analyses? Comments: - Overall, both the Intellectual Merit and Broader Impact criteria are for the most part addressed in the proposal summary, in the reviewers' comments, in the panel summary, and in the review analysis provided by the program officers. - There are a few cases of reviewers not addressing the BI. This may be addressed by using separate boxes that need to be filled and through education and mentoring of the community.	Yes, largely

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? Comments: Based on the eJackets sampled, the reviewers of Aeronomy proposals were for the most part conscientious and provided substantive comments to explain their assessment of the proposals. There are some reviews that provide a really balanced review between strengths and weaknesses and it is not immediately clear which ones are more important decision-making regarding an award. The summary statement doesn't always help resolving these uncertainties. Sometimes reviewers (especially foreign ones) seem hesitant to rate high a proposal highly, which results in proposals rated VG, while the majority of reviews are glowing. When this happens the reviewers, who are probably accustomed to different rating system, don't realize that in order to get funded in the US, a proposal must be rated E. It would be more useful to calibrate reviewers beforehand so that they understand criteria for the meaning of such rating: E = fund it!; VG= Fundable; etc. … We recommend briefing of panels ahead of time. In some cases, the argument of the reviews seemed a bit thin on detailed rationale. In some of the multidisciplinary proposals involving coupling between the middle and upper atmosphere and the lower atmosphere, we felt that it would have been helpful to have additional review comments from reviewers with expertise and focus in the lower atmosphere. The COV recommends that the Section continue to educate the scientific community about the nature and variety of ongoing and emerging Broader Impacts and about the NSF expectations for broader impacts. We recommend that this information be included in the training for reviewers.	Yes, with varying degrees
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: - For the most part, the panel summaries gave rationale for decisions. In many cases, the review analysis gave more thorough rationale. - In several instances, there was no panel summary in the eJackets. Probably this was in cases where there was no panel. In some cases it would have been helpful to more clearly state in the review analysis that there was not a panel.	Yes, mostly

5. Does the documentation in the jacket provide the rationale for the award/decline decision? [Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.] Comments: - The Program officer writes a thorough explanation for his/her decision to fund a proposal, including a summary of key comments from the reviews. In some cases, the reviewers' concerns are also sent to the PIs to address. - In some cases, the project summary is not included in the eJacket. The project summary provides helpful context for helping to understand and interpret the reviews and panel summary.	Yes, mostly

6. Does the documentation to the PI provide the rationale for the award/decline decision? Comments: For the most part the reviewers' comments and the panel summaries did communicate to the PI rationale for the award/decline decision. The program officers' review analyses were particular helpful in explaining the rationale for decision making. We recommend considering redacting the names of the reviewers and then sending the review analysis to the PI. We recommend continuing to provide PIs and potential PIs with guidance about best practices for writing successful proposals and how they can improve declined proposals.	Yes, usually
7. Additional comments on the quality and effectiveness of the program's use of merit review process: With only a very few exceptions, both the Intellectual Merit and Broader Impact criteria were addressed in proposal summaries, by reviewers, in the panel summary and in the review analysis. Sometimes the comments, particularly as related to BI, were a bit thin in the reviews. We recommend continuing to educate the scientific community about the nature and variety of ongoing and emerging Broader Impacts and about the NSF expectations for broader impacts.	

The NSF program officers' presentations to the COV were very informative. We recommend finding ways to communicate this information to a wider audience at meetings and outside of meetings such as possibly via webinars. We recommend including both programmatic information about funding opportunities and also mentoring regarding best practices for proposals. Example of such practices could include research questions and sample data or modeling results, and to place the work in the context of broader research field. In addition to communicating broader impacts, we recommend that NSF educate the community on the proposal and review processes, such as holding 'town hall' meetings at conferences. This would benefit not only students and early career scientists but would also benefit mid- and late-career scientists as well. Consistency and openness in proposals and reviews would benefit everyone, make leveling more straightforward, and help increase diversity. Such communication is particularly timely as the Geospace targeted programs have moved to no longer having proposal deadlines. We suggest that the geospace division continue to communicate about how the proposal submission and review process functions without deadlines. To be able to reach the broadest audience, we recommend that this communication be done in several venues, including written messages to the community, at conferences, and potentially through a webinar that can then be posted online for later viewing.	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question**.**

SELECTION OF REVIEWERS	**YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE**
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: While reviewers are largely knowledgeable, there is a need sometimes to weigh in their opinions with a metric that identifies their area of expertise. For example, some thin reviews could have been caused by the reviewer having little insight on the topic. Reviewers ought to be able rate their own area of expertise. In a few cases for multidisciplinary proposals, the review process would likely have benefited from input from reviewers from other areas outside of geosciences.	Yes, largely
2. Did the program recognize and resolve conflicts of interest when appropriate?	Yes, all across

Comments: Yes, COIs were addressed. Reviews were not used if there was found to be a COI and panelists left if there was a COI.	
3. Additional comments on reviewer selection: - COI seem to be too restrictive especially for a small community like AER where numerous collaborations do take place across institutions. This situation may make it difficult to convene panels and assign reviewers	

III. Questions concerning the management of the program under review. Please comment on the following:

MANAGEMENT OF THE PROGRAM UNDER REVIEW
1. Management of the program. Please address qualities such as timeliness in making decisions and program mortgages. Comments: - Broadly speaking, management of the program is excellent, timely and actively involved in the variety of program supported. - It is clear that the program managers work very diligently to do an excellent job managing their programs. The review analysis is thorough and well-explained.
2. Responsiveness of the program to emerging research and education opportunities. Comments: - During the 2018 COV period, the Aeronomy program co-funded interdisciplinary projects with other NSF programs. - The COV recommends that Geospace continue to work to reduce barriers to multidisciplinary projects, particularly those that may lead to new insights regarding atmospheric processes, space weather and climate change.
3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments:

The portfolio is guided by the CEDAR strategic plan, the Decadal Survey, and the Geospace Portfolio review.

4. Responsiveness of program to previous COV comments and recommendations.

Comments:

Based on the eJackets that were reviewed, there was agreement with the previous COV 2014 that overall the Aeronomy program directors "did an excellent job of reflecting the reviewers' assessments while providing rationale for the overall decision" (2014 COV) during the time period covered by the 2018 COV. Conflicts of Interest were addressed in the panels and in the program review analysis provided by the aeronomy program directors. Like the previous 2014 COV and based on the eJackets that were reviewed for the 2018 COV, there was "no instance where either the integrity of a proposal review or the ensuing decision was impacted by COI".

In regards to diversity, the COV applauds the response of the GS Directorate to educate panelists about the value that NSF places on diversity and to raise awareness about implicit bias. The GS response to the COV reports that the Aeronomy program co-funded a number of interdisciplinary programs with other NSF programs. The COV applauds these interdisciplinary efforts and encourage the NSF program directors to continue to publicize and educate the aeronomy community about the existing interdisciplinary projects and NSF wide interdisciplinary solicitations such as the INSPIRE program, the SEES-Hazards program, the PRE-EVENTS program, and EarthCube. The COV recommends continued communication of this information at meetings as well as though other electronic means for those not in attendance at the conference.

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and subdisciplines of the activity? Comments: The Aeronomy program has funded proposals addressing the middle and upper atmosphere and the neutral atmosphere and ionosphere. The funded proposals include projects addressing coupling between atmospheric regions.	Yes for the most part
2. Are awards appropriate in size and duration for the scope of the projects?	Yes for the most part

Comments: - Better measures of the portfolio balance need to be provided, specifically in regards to the average duration of a grant. The duration of a project is likely to be different between projects of different scopes. More information on the distinction between these is needed. - From the project summaries that the general impression is that the awards are appropriate in size and duration for the scope of the proposed projects. However, the focus was on the review process and more time would have been needed to try to provide a more thorough judgement of the size of the awards in relation to the scope of the proposed projects.	
3. Does the program portfolio include awards for projects that are innovative or potentially transformative? Comments: High quality proposals in multiple disciplines of aeronomy have been funded. There were proposals that pulled together data from multiple instruments and used these data in conjunction with models to address challenging science questions. Again, the focus was on the merit review process and more time would have been needed to do a thorough review of the science projects being funded.	Yes
4. Does the program portfolio include inter- and multi-disciplinary projects? Comments: Yes, the program portfolio does include inter- and multi-disciplinary projects involving coupling to forcings from below and to the magnetosphere. In some cases, it might have been helpful to have reviewers from outside aeronomy to assist in the assessment of multi-disciplinary proposals. It may be helpful to consider additional education about NSF opportunities to encourage joint projects between CEDAR/GEM/SHINE science and with the lower atmosphere/ocean science. A recommendation is to continue to find ways to foster integrative projects across Geospace Divisions, as well as with other divisions such as the lower atmosphere, ocean science, plasma physics, engineering, computer science, and education.	Yes
5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? Comments:	Yes, for the most part

There are aeronomy projects funded from PIs throughout the country and from different regions, including the East Coast, South, Southwest, Midwest and Western regions.	
6. Does the program portfolio have an appropriate balance of awards to different types of institutions? Comments: There are funded aeronomy proposals from Research Intensive PhD granting institutions, PhD granting institutions, institutions that grant Masters degrees, and from non-academic institutions. Broadly speaking, the distribution of institutions is similar to that of the other Geospace programs.	Yes
7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? NOTE: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award. Comments: - For AER the variability of new PI is probably natural and the program should continue to strive for more new-PI awards every funding cycle. - The COV applauds the funding of CAREER proposals by the aeronomy program.	Yes, mostly
8. Does the program portfolio include projects that integrate research and education? Comments: Many of the broader impacts train students and include Geospace content in curriculum and outreach. The CAREER proposals integrate research and education.	Yes
9. Does the program portfolio have appropriate participation of underrepresented groups[1]? Comments:	

[1] NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

The percentage of aeronomy awards to women scientists fluctuates somewhat from year to year. Overall the percentage of reviewers who are women is approximately correlated with percentage of proposals submitted to aeronomy from women. The percentage of proposals from people in underrepresented racial/ethnic groups remains quite small and may be growing slightly, but this may be due to small numbers. The COV applauds efforts by the aeronomy community to support the inclusion and professional growth of persons from underrepresented groups in the field of aeronomy, including by providing funding for students to attend the CEDAR conference and outreach to historically black colleges and universities. The program officers presented thoughtful and informative presentations. The COV recommends that the NSF Program Officers continue to develop ways to provide mentoring regarding writing and reviewing proposals to a broad audience. Some ideas to do so include communicating best practices for writing and reviewing proposals in several venues, including written messages to the community, at conferences, and potentially through a webinar that can then be posted online for later viewing. An additional way to invite community members to learn more about the proposal writing and reviewing process is to have the NSF Program Officers consider holding "office hours" during some lunch times during the CEDAR Workshop. Additional education and mentoring regarding best practices for proposal writing and reviewing can benefit people from underrepresented groups, as well as other members of the CEDAR community.	
10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. Comments: During the 2018 COV period, the Aeronomy program funded projects that addressed the 2012 Space and Space Physics Decadal Survey, particularly addressing its scientific goal to "Determine the dynamics and coupling of Earth's magnetosphere, ionosphere, and atmosphere and their response to solar and terrestrial inputs." The projects funded by the Aeronomy program also addressed the scientific goals of the CEDAR strategic plan and the co-funding of projects by aeronomy with other NSF programs contributed to the CEDAR "Strategic Thrust #1: Encourage and Undertake a Systems Perspective to Geospace".	Yes
11. Additional comments on the quality of the projects or the balance of the portfolio: Overall the aeronomy program officers have been doing an excellent and conscientious job serving the community.	

FY 2017 REPORT TEMPLATE FOR NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: May 2 -3, 2018
Program/Cluster/Section: Space Weather Research
Division: Atmosphere and Geospace Sciences
Directorate: Geosciences
Number of actions reviewed: **Awards:** 11 **Declinations:** 6 **Other:** 1
Total number of actions within Program/Cluster/Division during period under review: **Awards:** 29 **Declinations:** 49 **Other:** 12
Manner in which reviewed actions were selected: A random sample of 5% of award, decline and other actions along with a selection of additional jackets where provided to the committee for their review. The committee was also provided with the complete list of all actions taken during 2014-2017 period.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question**.**

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? Comments: Reviews were a mix of panel (CubeSat, FDSS), mail-in (Space Weather), and no external reviews (RAPID). The types of reviews seemed entirely appropriate for the different areas. The CubeSat and FDSS opportunities represent a real competition among the various concepts, for which panel reviews represent the best means of evaluation. The Space Weather Instrumentation proposals come from a collection of community serving instruments, for which there is not a direct competition. The main evaluation in this case is to assess if the service provided does indeed support the community, and if the means proposed is appropriate. Mail-in reviews are appropriate in this case.	Yes
3. Are both merit review criteria addressed d) In individual reviews? For the most part the individual reviews do address both criteria, though were occasional cases where this was not true. For example, one mail-in review gave fairly extensive review of the Intellectual Merit, while under Broader Impacts it said simply "The data from SuperMAG network has been contributing a lot for student training." e) In panel summaries? All of the panel summaries reviewed addressed both criteria, though with varying emphasis. f) In Program Officer review analyses? All of the PO analyses addressed both criteria. Comments:	Yes, for the most part

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? Comments:	Yes, for the most part

Nearly all of the reviews were substantive and provided adequate justification for the proposal rankings. There were a few exceptions to this where rather low rankings were given although no substantial weaknesses were cited in the review. In some cases the reviews were very brief with little justification given.	
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: All of the panel summaries provided a thorough explanation of the ratings with clear reasons cited in both the Intellectual Merit, and the Broader Impacts. There was only one case where the panel summary conflicted with the reading of the reviews. In that case the reviews were more critical than the summary. That proposal was submitted for consideration under EPSCOR and was eventually funded.	Yes
5. Does the documentation in the jacket provide the rationale for the award/decline decision? [Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.] Comments: As discussed above the review types were appropriate to the proposals, and the reviews were for the most part comprehensive and consistent with the ratings. In nearly every case the PO review analysis matched the reviews and summaries. In one case, the review analysis came to a final recommendation that differed from the panel consensus and supported a proposal that was not in the competitive range. In that case there were other factors that the PO cited and the difference was justified.	Yes

6. Does the documentation to the PI provide the rationale for the award/decline decision? [Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.] Comments:	Yes

The team did not find a single case where the documentation to the PI differed substantially from the other documentation in the jacket. As discussed above the jackets provide thorough and appropriate documentation for the decisions.	
7. Additional comments on the quality and effectiveness of the program's use of merit review process: The merit review process of the Space Weather program seems excellent The review methods were appropriate and they were applied consistently.	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question**.**

SELECTION OF REVIEWERS	**YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE**
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: The panels appeared to have a good mix of reviewers, which is particularly difficult for the CubeSat program, where the proposals must make a good scientific case, must have a good engineering design, and must have a good management plan. The reviews indicated that each of these topics was appropriately addressed.	Yes
2. Did the program recognize and resolve conflicts of interest when appropriate? Comments: No example was found where a conflict caused a problem with the review process.	Yes
4. Additional comments on reviewer selection: There is a potential problem created by the NSF's apparent increased concern about perceived conflicts of interest. The pool of potential panelists could become so limited that it will impact the quality of the review process.	

III. Questions concerning the management of the program under review. Please comment on the following:

MANAGEMENT OF THE PROGRAM UNDER REVIEW
1. Management of the program. Please address qualities such as timeliness in making decisions and program mortgages. Comments: Management of the program appears to be quite good. The time for decisions ranged from less than a month (RAPID) to in one case about 2 years. For the most part, the decisions were within a year. The cases where there was a longer timeline were where funding from other sources (EPSCOR, NASA) was sought.
2. Responsiveness of the program to emerging research and education opportunities. Comments: The CubeSat program illustrates a specific focus on emerging research and education opportunities. NSF Geospace originated the program at a time when NASA and other agencies did not recognize the value. Since then, these other agencies have come around and now have their own programs. Further, the program has always emphasized student participation in all aspects of the missions, which has provided outstanding opportunities for education in both science and engineering.
3. Program planning and prioritization process (internal and external) that guided the development of the portfolio. Comments: The Space Weather program as created to include the three areas: CubeSats, FDSS, and Space Weather Instrumentation. The portfolio is aligned with these three priorities.
4. Responsiveness of program to previous COV comments and recommendations. Comments: The 2014 COV report did not have many recommendations specifically addressed to the space-weather program. The main overarching recommendation was for the section to undertake the Portfolio Review, which it did, and to specifically address CubeSats in that review. The Portfolio Review did indeed take place, and it did indeed address CubeSats. One specific finding of the PR was that the majority of the publications stemming from the funded CubeSats to date have been engineering related, and that he scientific output has been rather low. It's recommended that future reviews of CubeSat proposals place a stronger emphasis on likely scientific contributions.

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and subdisciplines of the activity? Comments: The SWR program is composed of four program areas, some of which have fairly well defined budgets (CubeSats, FDSS, SWM, Class 2 Facilities) The only place for adjustments to the balance seems to be within the individual categories. Given this caveat, the balance seems to be appropriate.	Yes
2. Are awards appropriate in size and duration for the scope of the projects? Comments: The awards are constrained by the overall budget, however the individual awards seem appropriate. In the one case the budget and duration were reduced from those proposed because the reviews recommended eliminating part of the scope. The FDSS program funding has been fairly ad hoc, with the GS section allocating funding when possible. When the program has been offered, the funding level has been appropriate.	Yes
3. Does the program portfolio include awards for projects that are innovative or potentially transformative? Comments: FDSS is in itself somewhat innovating and potentially transformative. It supports the creation of faculty positions with the intent of ensuring the future vitality of the discipline, which shows forward thinking on the part of the section. CubeSats are innovative and have transformed the way we think about space-based measurement. Prior to their creation, measurements were carried out by instruments costing several million dollars on spacecraft costing hundreds of millions. Today, an entire mission can cost less than a million dollars. Further, previous missions did not provide many opportunities for student participation in design and fabrication.	Yes

CubeSats have enabled participation of students in design, fabrication, operation, and data analysis, i.e. they enable student participation in all phases of a mission.	
4. Does the program portfolio include inter- and multi-disciplinary projects? Comments: CubeSats typically involve engineering and science components, in both research and in education.	Yes
5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? Comments: The sampling of jackets reviewed had contributions from California, New Mexico, Kentucky, Maryland, Kansas, Florida, Michigan, New Hampshire, Montana, Alabama, Alaska, and Colorado.	Yes
6. Does the program portfolio have an appropriate balance of awards to different types of institutions? Comments : The majority of awards were to PhD granting Universities, but there were also awards to Master's level institutions, NASA (CCMC), a University Affiliated Research Center (JHUAPL), and a private company (SRI)	Yes
7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? NOTE: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award. Comments:	
8. Does the program portfolio include projects that integrate research and education? Comments: Both the FDSS and CubeSat programs have strong education components as well as research. FDSS supports the creation of tenure-track faculty positions with the goal	Yes

of enhancing space physics education. The proposals are highly competitive and are evaluated on the criteria of likelihood of developing a successful research program and on integration into the teaching curriculum. As discussed in other sections, the CubeSat program does an excellent job of bringing students into satellite design and data analysis projects.	
9. Does the program portfolio have appropriate participation of underrepresented groups? Comments: Of the representative sample of jackets selected for this review, only one is listed as having minority involvement, and none listed women involvement. It isn't clear however if this is representative of the proposals that were submitted. In addition, some of the proposals with educational or outreach components do address their efforts toward including under-represented groups. The material presented at the COV review indicated that both of the most recent FDSS awards resulted in hires of females. While this may not have been the intent behind the awards, creating opportunities for new faculty hires within the area enabled the women who have been brought into the field through the CEDAR and GEM programs focus on recruiting under-represented groups.	Data not available
10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. Comments: The program directly addresses the goals outlined in the National Academy Decadal Survey for Space Science, and those of the Office of Science and Technology Policy National Space Weather Action Plan. The Decadal Survey presented the DRIVE initiative, in which the "D" comes from: "*Diversify observing platforms with microsatellites and midscale ground-based assets*", and the "E" comes from: *"Educate, empower, and inspire the next generation of space researchers."* The Space Weather Action Plan outlines a variety of activities, which include providing observations for research on space weather, which is the core function of the SWR program.	Yes
11. Additional comments on the quality of the projects or the balance of the portfolio: As a whole the projects supported by the SWR program are of a very high quality. The extremely competitive programs supported in SWR have low success rates, with only the most highly rated proposals being awarded. In particular, the FDSS and CubeSat program success rates are under 15%.	

NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: May 2 -3, 2018
Program/Cluster/Section: Geospace Facilities
Division: Atmosphere and Geospace Sciences
Directorate: Geosciences
Number of actions reviewed: **Awards:** 6 **Declinations:** 7 **Other:** 3
Total number of actions within Program/Cluster/Division during period under review: **Awards:** 6 **Declinations:** 7 **Other:** 3
Manner in which reviewed actions were selected: Given the small number of actions taken by this program the committee reviewed all award, decline, and other actions.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question**.**

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? Comments: Proposals submitted to the Geospace Facilities programs are reviewed via a wide range of methods including mail-in reviews, panels, and program officer reviews. ISR facilities proposals were reviewed by mail-in or by mail-in and panels. In all cases proposals subjected to external review included at least three separate reviewers. EAGER, RAPID, and INSPIRE proposals were reviewed by the program officers.	Yes
Are both merit review criteria addressed g) In individual reviews? h) In panel summaries? i) In Program Officer review analyses? Comments: All reviewer and panel reports universally included comments on the intellectual merit and broader impacts review criteria for the proposals they reviewed.	Yes

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? Comments: Almost all reviewers included enough detail to support their claims about the proposals and help support the POs decision. There are a few isolated reviews that were too terse to be useful or where unsubstantiated comments were made, but the reviews were, on average, of very good quality.	Yes
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments:	Yes

Panel summaries universally conveyed the panel consensus in a clear and succinct way, as well as a synopsis of the reasoning behind the consensus.	
5. Does the documentation in the jacket provide the rationale for the award/decline decision? [Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.] Comments: PO comments and analyses included in the eJackets were extremely detailed and did an excellent job explaining the funding decision made. There was one instance when the documentation was a bit lacking and this situation seems to correspond to a changeover in the PO position, where information about proposal handled by a previous PO may not have communicated to the new PO (it is somewhat difficult to determine what exactly happened in this case). This is understandable but should be avoided if at all possible.	Yes

6. Does the documentation to the PI provide the rationale for the award/decline decision? [Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.] Comments: The documentation included with the eJackets is quite extensive and is clear on how funding decisions were reached. In the sense that the PIs can see the individual reviewer reports and panel summaries, the source of the decision will be obvious. In the case of EAGER awards, which typically do not undergo external review, the PO analysis, which is very detailed, is communicated to the PI.	Yes
7. Additional comments on the quality and effectiveness of the program's use of merit review process: None	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question**.**

SELECTION OF REVIEWERS	YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: The proposals were reviewed by individuals with a wide range of backgrounds, which is considered a strength. In addition, the larger ISR facilities proposals also included reviews from individuals who were familiar data from these systems.	Yes
2. Did the program recognize and resolve conflicts of interest when appropriate? Comments: In cases where conflicts were identified the program officer dealt with them appropriately.	Yes
3. Additional comments on reviewer selection: In the future, NSF's strict COI rules may make reviewing, e.g., large ISR facility proposals more difficult due to the dearth of unconflicted reviewers who can comment on detailed facilities operations.	

III. Questions concerning the management of the program under review. Please comment on the following:

MANAGEMENT OF THE PROGRAM UNDER REVIEW
1. Management of the program. Please address qualities such as timeliness in making decisions and program mortgages. Comments: Geospace Facilities is very well-managed; almost all proposal decisions are made and communicated in a timely manner and the reviews and program officer analyses are extremely thorough and do an excellent job documenting and justifying the funding decision.

There was one instance where a decision regarding a proposal (EAGER/RAPID) seem to have taken quite a while. This may have been partly due to the fact that these proposals seem to be leftovers from a previous program officer, and this situation can be easily avoided in the future.

Program officer presentations to the COV panel outlined a plan to reduce the mortgage rate of the facilities program based on divestments from the Sondrestrom and Arecibo facilities, though it is not unreasonable for the mortgage rate to remain somewhat high due to the large size of the facilities awards. Reduced mortgage rates should allow for funding of new research related to development of future geospace facilities per the portfolio review recommendations.

2. Responsiveness of the program to emerging research and education opportunities.

Comments:

The Geospace Facilities program funded several of EAGER and RAPID awards, which are intended to provide timely funding for research addressing trends in the field. In addition, there was at least one award that funded travel to a summer school-type of program for students. Given the small overall number of awards from geospace facilities, it is commendable that some funding has been directed to EAGER/RAPID research in addition to education and public outreach.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments:

The Geospace portfolio review process has recently been completed, and, thus, it should be possible to develop a concrete plan for funding development of future, new facilities. Discussions with program officers have made it clear that this process has started and is likely to progress significantly in the next COV period and should be re-evaluated then.

4. Responsiveness of program to previous COV comments and recommendations.

Comments:

The facilities program has been responsive to past COV recommendations and the Geospace portfolio review; some specific comments from past COV panels are included below.

Regarding Facilities Lifetime Management recommendations:

Significant progress has been made regarding facilities planning including initiated of transition planning for the SRF facility, re-competition of Arecibo, and planning of how to allocate future facilities funding freed up by these decisions (e.g. toward modernization, reducing mortgage rates, and future investments). Nothing has been finalized but it is clear, from the program officer comments, that the portfolio review recommendations regarding life-cycling are in the process of being considered for implementation.

Regarding operations vs. science in facilities budget:

As pointed out by the program officers, clear guidance is provided in the facilities solicitation and also in the Geospace portfolio review with regards to expectations about funding for operations and science in these grants. The question of balance between operations vs. science funding appeared frequently in facilities reviews and may reflect reviewer unfamiliarity with the solicitation guidelines.

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and subdisciplines of the activity? Comments: Geospace facilities program funding overwhelming goes to support the large ISR facilities; however, there have also been awards made to fund different types of activities including instrument array campaigns, etc.	Yes
2. Are awards appropriate in size and duration for the scope of the projects? Comments: The large ISR facilities proposals reviewed as part of the COV process (JRO and Sonde) were funded for three years instead of the typical five, which seems like a short time frame from the standpoint of having to manage a large facility and increases the burden on the PIs who must then submit proposals more frequently. For Sondrestrom the program officer analysis makes it clear that it is funded for a shorter amount of time so that it can be re-evaluated in the context of the portfolio review. The 2014 JRO award was also three years, for budgetary reasons, but was apparently renewed again for 5 years (the normal facilities time frame and that expected for future awards).	Yes
3. Does the program portfolio include awards for projects that are innovative or potentially transformative? Comments: Several RAPID/EAGER awards were made during the period reviewed by the COV.	Yes

4. Does the program portfolio include inter- and multi-disciplinary projects? Comments: Facilities awards support a wide range projects (e.g. the ISR facilities) which include studies spanning ionospheric, magnetospheric, and atmospheric physics.	Yes
5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? Comments: N/A due to the small number of awards made.	N/A
6. Does the program portfolio have an appropriate balance of awards to different types of institutions? Comments: N/A due to the small number of awards made.	N/A
7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? NOTE: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award. Comments: Generally speaking, it would be somewhat unusual to have a new investigator be PI of a large facility, and indeed this is not the case for any awards made. Several of the awards did include involvement from young investigators which is considered a strength.	Yes
8. Does the program portfolio include projects that integrate research and education? Comments: Yes, at least one award included travel funding for a summer school-type program, hence contributing to student education and outreach. In addition, facilities routines	Yes

funds and ISR summer school, which is a valuable resource for graduate students seeking to use data collected as part Geospace-facilities funded projects.	
9. Does the program portfolio have appropriate participation of underrepresented groups[2]? Comments: No awards had reported minority involvement and only one funded award went to a female PI. This is not surprising given the small number of awards made; however, the facilities program should continue to strive to support investigators from underrepresented groups.	No
10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. Comments: The facilities program supports observations important to monitoring of space weather, an important national priority. As mentioned elsewhere in this report, the Geospace facilities program has been particularly strongly impacted by the portfolio review, and the PO's have made significant headway in developing plans to implement the reviews suggestions.	Yes
11. Additional comments on the quality of the projects or the balance of the portfolio: None	

2

FY 2017 REPORT TEMPLATE FOR NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: May 2 -3, 2018
Program/Cluster/Section: Magnetospheric Physics
Division: Atmosphere and Geospace Sciences
Directorate: Geosciences
Number of actions reviewed: **Awards:** 12 **Declinations:** 14 **Other:** 2
Total number of actions within Program/Cluster/Division during period under review: **Awards:** 97 **Declinations:** 211 **Other:** 20
Manner in which reviewed actions were selected: A random sample of 5% of award, decline and other actions along with a selection of additional jackets where provided to the committee for their review. The committee was also provided with the complete list of all actions taken during 2014-2017 period.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question**.**

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? Comments: There were 2 types of reviews and the methods for the two types were different. The first type was primarily for the Core program, and the appropriateness varied with Program Officer (PO). This type used 3-4 Ad hoc reviewers, then the PO put together a summary review based on these reviews and made a decision to award or not. In some cases, the reviews were thoroughly considered and the decision well documented. In other cases, the summary review did not well document how the decision was made. In all cases there was no information on how different proposals in the Core program were inter-compared to decide which to award. The other type of review used a virtual review panel, with 2-3 panelists and sometimes supplemented with ad hoc reviewers. The panel discussion is not included in jackets, but with a few exceptions the summary reviews capture and content and the rating and ranking seem appropriate. In the discussion at the COV meeting, it was noted that AGS Geospace was moving towards using panels for both Core and GEM which we support as most appropriate. Also noted: One proposal was returned because it did not fulfill the specific criteria that the GEM program requires for submission. One was withdrawn based on correspondence with the PO that the proposal would be declined that year because the PI had already won in another program. The proposal could be withdrawn and resubmitted in a later year. There was one proposal for conference support that was not reviewed, but a waiver put in place. It was awarded. There was an EAGER proposal that was awarded without review.	Yes
2. Are both merit review criteria addressed a) In individual reviews? b) In panel summaries? c) In Program Officer review analyses? Comments:	Yes (a) Yes (b) Yes (c)

One case was noted in which an ad hoc reviewer did not address broader impacts. There was some unevenness in the two criteria. Generally, intrinsic merit was more thoroughly discussed than were the broader impacts.	

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? Comments: On average, there were about 2 substantive signed reviews per proposal – always at least one. Of course, a review can usually be identified as substantial if it identifies important weaknesses in the proposal; statements of strength tend to be somewhat general and bland and are often more or less lifted from the proposal. In the majority of cases where a review was not substantial, it was because the person wasn't really that expert on the topic of the proposal.	Yes
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: The panel summary always provided a rationale for the consensus, but: 1. Sometimes there wasn't a panel, in which case the Program Officer provided the rationale. 2. In some cases, the Panel Summary simply copied passages from an individual review, which might give the PI the impression that the panel didn't give serious attention to the proposal. 3. In other cases, the Panel Summary seemed to ignore comments by individual reviewers. In one case, the ignored reviewer was clearly very expert and was a direct competitor. 4. In one case in which the proposal was declined, the Program Officer's rationale for declining the proposal was completely different from the panel's. The critical part of the panel's summary was taken from the primary reviewer on the panel, who was not particularly expert on the topic; the ad hoc reviewers who had the critical expertise rated the proposal very highly. Some deserving proposals were rejected because of lack of funds. Often the main identified weaknesses —e.g., not enough detail on some point – were really pretty minor. We don't know how to improve that situation.	Yes
5. Does the documentation in the jacket provide the rationale for the award/decline decision? [Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.]	No/Yes

Comments: The Review Analysis file contains the rationale for how the decisions were made. The rationale for the Core program is not complete. In all cases there was no information on how different proposals in the Core program were inter-compared to decide which to award. The context document seems to be for the entire program across all disciplines. There is no information on how many MAG proposals or CAREER proposals, etc. were considered. The GEM program and some CORE program years used panels, and in these cases, it is clear how the award/decline decision was made. Most proposals in the highly recommended category were awarded. For deserving proposals that were not awarded, the decision was generally based on insufficient funding.	

6. Does the documentation to the PI provide the rationale for the award/decline decision? [Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.] Comments: Communication between Program Officer and PI is incompletely documented. The Review Analysis was often the most incisive element in the jacket, but that information does not go to the PI. Perhaps a redacted version of the Review Analysis could be sent to the PI.	
7. Additional comments on the quality and effectiveness of the program's use of merit review process:	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question**.**

SELECTION OF REVIEWERS	**YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE**
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments:	Yes

In the jackets reviewed, the individual written reviews included at least one real expert on the topic in question, and often there were several such people. There were a few cases in which the most serious weakness identified in the proposal came from somebody who was not particularly expert on the topic of the proposal, and that is a bit worrisome. This relates to one of the challenges in the review process, which is to try to minimize the number of factually incorrect statements that occur in the reviews or summaries. We don't have a simple solution to that problem.	
2. Did the program recognize and resolve conflicts of interest when appropriate? Comments: COI software auto-generated a COI check for most of the proposals, and then the PO reviewed the output. Conflicts of interest for all panelists were marked on Form 7 in eJacket. Any panelists who had a conflict of interest with a particular proposal disconnected from the virtual meeting and did not participate in the panel discussion of the proposal. When an ad hoc reviewer was found to have a COI, his/her review was eliminated from consideration.	Yes
3. Additional comments on reviewer selection: It would certainly help increase the expertise of reviewers if Conflict-of-Interest rules were eased a bit. Many-author papers are increasingly common, and often co-authors don't even know each other.	

III. Questions concerning the management of the program under review. Please comment on the following:

MANAGEMENT OF THE PROGRAM UNDER REVIEW
1. Management of the program. Please address qualities such as timeliness in making decisions and program mortgages. Comments: There was a peak in MAG dwell times in 2016, perhaps due to multiple changeovers in Program Directors. Dwell time was back to normal in 2017. The mortgage rate in MAG seems to be going down, due mostly to making more standard grants -- a welcome development
2. Responsiveness of the program to emerging research and education opportunities. Comments: MAG Program Directors have generally been good about letting the community know about crosscutting NSF programs that represented funding opportunities. NSF seems to regard the grassroots-driven GEM program, with its

ever-evolving focus groups, as a leading indicator of scientific opportunities, and that seems appropriate.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments:

As Geospace programs continue to decline relative to inflation, experienced and competent geospace scientists are being forced to leave the field or the country. Perhaps there should be some effort to help mid-career scientists, not just students and people early in their careers.

4. Responsiveness of program to previous COV comments and recommendations.

Comments:

Responsiveness was very good, on the whole. Specifically:

(i) The e-Jacket system has clearly been improved a lot.

(ii) The previous panel complained about Conflict of Interest regulations unnecessarily strict, resulting in difficulty finding expert reviewers. That situation hasn't improved, but those policies are NSF-wide, and there is not much our little section can do about them.

(iii) The Section has endeavored to address the need for more diversity by emphasizing it in the instructions to panels.

(iv) The 2014 COV encouraged investment in the CubeSat and FFSS, and NSF has pushed those programs.

(v) The 2014 COV also recommended increased participation by Geospace scientists in interdisciplinary efforts, and NSF has initiated INSPIRE, PRE-EVENTS, and various other interdisciplinary efforts.

(vi) The same COV recommended increased use of virtual panels, while still keeping some physical meetings, and NSF has done that.

(vii) The same COV emphasized the need for long-term planning for facilities and a full portfolio review. The Portfolio Review has been completed, and a plan for dealing with the problem of aging facilities is being carried out.

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and subdisciplines of the activity? Comments: Considering Mag sub-disciplines to be regions of interest – Dayside, inner mag, magnetotail, MI(T) coupling, Aurora – there were approximately equal numbers of awards in each.	Appropriate
2. Are awards appropriate in size and duration for the scope of the projects? Comments: Awards from both the Mag Core GEM Programs are typically 3 years in duration but the award size varies from $300K to $800K. The PO usually awards the amount that is solicited unless the scope of the project is reduced, in which case the funding is reduced. A conference was supported and that was under $50K for one year.	Appropriate
3. Does the program portfolio include awards for projects that are innovative or potentially transformative? Comments: One ionosphere-magnetosphere EAGER grant was awarded (without any external reviews), and it claimed to be transformative. In a field as mature as magnetosphere-ionosphere-thermosphere physics, there aren't many projects that really turn out to transform the field, and it is really hard to identify them before they are carried out.	Appropriate
4. Does the program portfolio include inter- and multi-disciplinary projects? Comments: Many MAG proposals overlap with Aeronomy, and overlap with STR and laboratory plasma physics is not unusual.	Appropriate

5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? Comments: Among the jackets we reviewed, the awards went to institutions in Alaska, Colorado, Maryland, Massachusetts, Minnesota, New Hampshire, Virginia, and West Virginia.	Appropriate
6. Does the program portfolio have an appropriate balance of awards to different types of institutions? Comments: Most awards in reviewed were awarded to Universities. 2 awards are to University Affiliated Research Centers (JHUAPL, SSI).	Appropriate
7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? NOTE: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award. Comments: Most of the Broader Impacts cited in the proposals have an education/outreach emphasis, and the early-career grants are effective. However, since funding for magnetospheric physics has been dropping relative to inflation for years and that trend is unlikely to reverse any time soon, competent and experienced scientists are being forced to leave the field or the U.S. Perhaps some way could be devised to help mid-career scientists.	Appropriate
8. Does the program portfolio include projects that integrate research and education? Comments: Yes. There are many examples of this in the portfolio.	Appropriate
	N/A

9. Does the program portfolio have appropriate participation of underrepresented groups[3]? Comments: The number of female PIs in the MagJackets sample is 5 or 18%. This percentage is less than the percentage of women in the mag sub-discipline. NSF should continue to encourage women to be PIs. The number of other underrepresented minorities is negligible. We applaud NSF for instituting a program targeting HBC and suggest that a program targeting Hispanics. These programs could increase the percentage of underrepresented groups.	
10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. Comments: NSF played a leading role in the National Space Weather Program from its beginning. NSF's Geospace Section is now particularly relevant to the national Space Weather Strategy and Action Plan, which the White House has issued.	Appropriate
11. Additional comments on the quality of the projects or the balance of the portfolio: Overall, the NSF Geospace portfolio is well run and does an excellent job with limited resources.	Appropriate

[3] NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

FY 2017 REPORT TEMPLATE FOR NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: May 2 -3, 2018
Program/Cluster/Section: Solar Terrestrial Research
Division: Atmosphere and Geospace Sciences
Directorate: Geosciences
Number of actions reviewed: **Awards:** 13 **Declinations:** 16 **Other:** 3
Total number of actions within Program/Cluster/Division during period under review: **Awards:** 89 **Declinations:** 241 **Other:** 52
Manner in which reviewed actions were selected: A random sample of 5% of award, decline and other actions along with a selection of additional jackets where provided to the committee for their review. The committee was also provided with the complete list of all actions taken during 2014-2017 period.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question**.**

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	**YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE**
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? Comments: In the COV period STR reviews mainly consisted of ad-hoc, mail in, and primarily virtual panels. All methods, including in-person panels, contribute to the overall review of proposals when combined in the right way. For example, mail in reviews are effective in providing expertise not otherwise available but do not allow for leveling of scores. Virtual panels, as opposed to in-person panels, are deemed more efficient in that they are significantly less expensive, more ecological, and achieve expanded community participation. Arguably, in-person panels remain the most effective in securing robust comparative proposal assessment, as well as mentoring younger scientists (as panel participants) in the overall review methods and NSF geospace activities. Therefore, the COV encourages NSF to continue to use a range of review methods, as was done in this period. A general recommendation for all NSF panels to ensure maximum academic participation is to avoid certain periods of the academic calendar, mainly finals at end of term.	Yes

2. Are both merit review criteria addressed a) In individual reviews? b) In panel summaries? c) In Program Officer review analyses? Comments: In general, reviewers address intellectual merit with greater attention and quantification than they do broader impacts. This is also true of proposers. To improve the understanding and exposition of broader impacts, NSF program personnel may wish to routinely inform community members about ongoing and emerging aspects of Broader Impacts. Detailed communication about the new US Government SWAP initiative for Space Weather needs is an example of this. The NSF personnel demonstrated effective intervention in addressing the lack of a single female awardee in a recent SHINE panel by subsequently briefing reviewers and panel members on topics such as unconscious bias, We expect and encourage such "community coaching" indefinitely to ensure that NSF achieves its societal goals of broader involvement by minorities, not just females but especially scientists of African and Hispanic origin, Panel summaries and review analyses in general better consider both criteria and the COV found and applauded examples where the PO successfully balanced IM and BI to make awards. For STR the PO has, in recent years, begun communicating the broader impacts at SHINE meetings – additional and ongoing quantification is necessary and advantageous to the community in general and should achieve improvements on the part of both proposers and reviewers. In addition to communicating broader impacts, we recommend that NSF educate the community on the proposal and review processes by, for example, holding 'town hall' meetings at conferences. This would benefit not only students and early career scientists but also mid- and late-career scientists as well. Consistency and openness in proposals and reviews would benefit everyone, make leveling more straightforward, and help increase diversity.	a) No b) No c) Yes

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? Comments: Most reviewers do provide adequate statements about major and minor strengths and weaknesses; a minor number of reviews arguably lack adequate detail and a small fraction fail to provide substantive comments. Because there is no consistent standard of review among scientists, there can be discrepancies between what is considered major vs minor strengths and weaknesses, as well as the rating; there are examples of proposals receiving a range of ratings from F to E. The training mentioned above to teach the community about the proposal and review process may help with this.	Yes
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: Panel summaries in general capture the strengths and weaknesses for both intellectual merit and broader impacts in a way that is typically reflective of the consensus rating. However, the STR Panel Summaries themselves are typically brief, somewhat generic and "sterile". The COV found that the Review Analysis provides a more robust analysis and description, better explaining the justification for the rating and award decision. One concern is that panel summaries are not always consistent with initial reviews (whether rated highly or poorly) and for some proposals the COV could find no justification in the various ejacket files to explain the reasons for this. The COV was unable to trace the logic and deliberation that transpired in order to reconcile disparate ratings among different review methods. In these cases, it is assumed the changes in scores came from a leveling of scores, but the strengths and weaknesses didn't necessarily change accordingly.	

5. Does the documentation in the jacket provide the rationale for the award/decline decision? [Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.] Comments: Yes, overall the collective material available in the ejackets provides comprehensive information from the mail-in reviews and panels such that the COV was able to achieve a thorough understanding of the rationale and review process. There are exceptions, such as exemplified by the two proposals noted above, where the necessary information could not be discerned in the ejackets. We note however, that it is challenging to compare awards and declines across different review methods and among dfferent panels to assess whether (or not) there is consistency. We acknowledge, for example, that inconsistencies in ratings that result in a successful award may reflect the budgets available, rather than any change in relative merit. However, the distribution of the weighting of the merit principles from panel to panel do exhibit some instances of inconsistency.	Yes

6. Does the documentation to the PI provide the rationale for the award/decline decision? [Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.] Comments: The communication to STR proposers about the award decision is typically brief and in a few instances, absent; at least it could not be found in the material available to the COV on the ejacket website. As mentioned previously, this feedback is generally somewhat "sterile" and expanded communication with the PIs could be helpful in guiding proposers – especially of declined proposals -about ways to improve their future proposals. The review analyses does provide a more complete picture of the rationale so communicating at least some of this information would be very beneficial to proposers. If identifying information and other sensitive information were removed, these could be beneficial in helping proposers improve their future proposals, especially for declined awards. The COV found that one straightforward reason communicated to the proposer for returning their proposal without review is a proposed budget that exceeds that given in the proposal announcement. While understandable and inarguable, the COV also found that in one instance at least the PI was encouraged to revise the budget, in contrast to other proposers who were not afforded this option.	Yes

7. Additional comments on the quality and effectiveness of the program's use of merit review process: The COV considers that overall the Geospace-ST program is of high quality and effective. We commend the response to the observations of the previous COV of the dearth of awards to female PIs in SHINE. As a result, the percentage of awards to women improved significantly in this latest COV period. That the overall number of proposals awarded to women is significantly fewer than that awarded to men reflects, in part, the lower fraction of female scientists in the geospace community. We encourage NSF and future COVs to evaluate such aspects of Broader Impacts as underrepresentation and geographical distribution in a relative, rather than (less meaningful) absolute sense. Under-represented minorities are so few that no meaningful data exist. We commend and encourage the program officer's use of a variety of programs available to promote increased diversity, which we envision as crucial for the indefinite future, especially for growing the number of scientists of African and Hispanic descent. One aspect would be better tracking of participation at all steps of the process. What percent propose, what percent review, what percent are accepted, what are the percentages in the STR community. A related concern is whether smaller numbers of women (and other minorities) are being asked to take on an outsized role as reviewers.	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question**.**

Selection of Reviewers	**YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE**

1. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: In spite of the difficulty in finding reviewers, it is clear that, for the most part, reviewers with the appropriate expertise are found. When necessary, proposals were also reviewed by other programs that contained the necessary expertise. In addition, we also found the reviewers to be honest about stating any limitations in their expertise. The COV notes that there is an inherent - and growing - tension between finding reviewers having appropriate expertise and at the same time not having a conflict of interest with the proposer (see below). The COV discussed with NSF personnel how this is a consequence of the geospace community's relatively small size and extensive (and expanding) collaborations. In at least one instance the Reviewer specifically stated that there was no COI but the review (which was very thorough) was nevertheless deemed NA because of the automatic COI software.	Yes

2. Did the program recognize and resolve conflicts of interest when appropriate? Comments: For the most part the program recognized and resolved all conflicts of interest, but this is being done with a rather heavy hand that may eventually be detrimental to the program and the community. The pool of available reviewers is shrunk unnecessarily as co-authors on papers are uniformly declared as conflicted. This ignores the reality that co-authorship can result from things as simple as providing data or model output, which might typically be provided to any member of the community. The current strict enforcement of predetermined COI "rules" seems to waste community time and assets. The COV noted, and discussed with Geospace and NSF personnel, the potential deleterious impacts of enforcing strict – automatic/algorithm induced – COI rules in reducing a somewhat limited pool of qualified reviewers.	Yes, for the most part
3. Additional comments on reviewer selection: That different methods of review engender different reviewer selection, coupled with limits on availability of qualified reviewers without a COI, sometimes results in a wide range of the number of reviews (from 2 to 6, for example) of individual proposals. Thus there is the dilemma of determining whether a proposal with only two reviews, both of which are E (for example) is of equal merit to another proposal with six reviews, only two of which are E. Such a lack of uniformity in the number of reviews may obfuscate determination of relative merit among proposals, which becomes increasingly important when budgets are limited for proposals that are near the cutoff of available funding.	

III. Questions concerning the management of the program under review. Please comment on the following:

MANAGEMENT OF THE PROGRAM UNDER REVIEW

1. Management of the program. Please address qualities such as timeliness in making decisions and program mortgages.

Comments:

The COV acknowledges that the current STP PO inherited a highly mortgaged program and commends the concerted and successful efforts that have subsequently reduced the program mortgage rate significantly. Although this was achieved in part by not having a SHINE solicitation in 2018, there were good reasons for this, namely that the program officer is seeking to align that solicitation around more focused topics. The current relatively low mortgage rate should allow for needed flexibility in the years ahead. The timeliness of decisions varies significantly from year to year. The most recent year, 2017, had a strong majority of proposals with dwell times no longer than 6 months. However, proposals with dwell times greater than 9 months increased slightly, to just under 20%. Keeping this percentage as low as possible is an ideal to strive for. However, that proposals are now accepted at any time, but are reviewed only when there is a sufficient number to warrant formation of a panel, means that a range of decision times is unavoidable.

2. Responsiveness of the program to emerging research and education opportunities.

Comments:

The STR program is strong in the number of EAGER proposals awarded, and the overall increase in the number of successful EAGER proposals indicates that responsiveness to emerging research is on the right track. Geospace personnel are fully cognizant of, and involved in, for example, the new national Space Weather Action Plan (SWAP) but the geospace community itself, possibly less so. NSF Geospace managers have begun active, ongoing communication of the SWAP program's requirements and opportunities to the community. It will likely be necessary to continually stress to the community that future proposers are expected to address and respond to emerging research by securing tangible outcomes, not just "lip service" promises. Since the NSF serves as the nation's incubator for emerging research, interactions among Geospace managers and other NSF Divisions and programs is important; evidence presented to the COV suggests that the Geospace managers are aware of, and responsive to, this. Education is strong as well, with high numbers of students participating in SHINE; it is also a component of many accepted proposals in the broader impacts. As noted above, educating, training and mentoring is crucial for increasing the numbers of awards to women and minorities. But this will likely require "active" rather than "passive" promotion of education opportunities. The COV notes that the instigation by Geospace of a collaborative project with Historically Black Colleges and Universities (HBCU) is an excellent example of this active approach. In contrast, the passive (and somewhat ubiquitous) approach of crediting proposers for including a female/minority postgraduate student is likely less effective.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments:

The program officer for STR has been active in addressing concerns of the community. The program officer is engaged with the community and is effective in using the SHINE conference to keep the community informed about NSF programs and plans and to educate the community about the Broader Impacts. This in turn has provided the program officer with the community needs and desires. The internal planning has been facilitated by improving the mortgage rate which has given the program officer the flexibility needed to meet the challenges of the future.
More generally, the current structure and portfolio of NSF's Geospace program has been in place for more than a decade and the approach of embedding targeted research programs within core disciplines, such as SHINE within STR (CEDAR within Aeronomy and GEM within Magnetospheric Physics) is widely acknowledged as having been very successful in focusing and coaligning the scientific community. However, this current program structure may not be as effective in upcoming decades. This is because the NAS Decadal Survey and Portfolio Review both stressed the necessity of future geospace research to transcend the existing discipline boundaries of solar terrestrial, aeronomy, and magnetosphere, in pursuit of fully integrated Sun-Earth system research.

4. Responsiveness of program to previous COV comments and recommendations.

Comments:

NSF STR was extremely responsive to prior COV recommendations, especially with improving the percentage of awards to women. Also, education of the community about Broader Impacts and consideration of BI is improving. Many reviewers have not yet put this into practice, however.
The COV commends the NSF geospace management for rapidly responding to the stated priority of the Decadal Survey and Portfolio Review of integrated Sun-Earth system research with the proposed implementation of a new interdisciplinary Integrated Geospace System program that effectively cuts across the three existing core/targeted research stove-pipes of the current program. Future challenges will be promoting and fostering integrated research within a community comfortable and established in their separate disciplines.

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and subdisciplines of the activity? Comments: With the COV only looking at a random sampling of proposals, and since separate "teams" only addressed proposals within individual disciplines, it is difficult to judge whether there is an appropriate balance of awards across the disciplines and subdisciplines. This balance ultimately derives from available funding and proposal pressure but not necessarily in obvious ways. For example, achieving balance may mean the active promotion of a discipline or subdiscipline with less proposal pressure that is nevertheless a crucial aspect of the overall program goals, such as, in the future, the extensive complexities of integrated Sun-Earth system research.	Data not available
2. Are awards appropriate in size and duration for the scope of the projects? Comments: Most awards to individual PIs have a duration of three years. Some awards are for one year only (e.g., travel grants) while the award to a "facility" is five years. As well, the size of the awards varies notably – from less than $100K to more than a few $100K, again depending on the program. The COV found that award sizes and duration are appropriate and consistent with other agencies. The Geospace managers and the COV recognize that the number of awards, award sizes and award duration compete with each other in fiscally constrained environments such as the present. That the award sizes have leveled off in recent years is indicative of a growing problem in funding the amount of research necessary for emerging needs and to sustain and train a vibrant community. With limited program funds, reducing award sizes enables more awards. However, this can't be done at the expense of achieving the highest quality scientific results. This problem is already leading to leakage of trained scientists from Geospace to other disciplines, and is likely to grow in the future, even as the national SWAP requires more, rather than less, Geospace expertise.	Appropriate

3. Does the program portfolio include awards for projects that are innovative or potentially transformative? Comments: Yes, the program has had CAREER (1) and RAPIDS (6) which account for a significant portion of the total number of such awards made across all programs. Nevertheless, reviewers tend to be more capable and comfortable rating less risky proposals more highly than innovative of transformative proposals. "Coaching" of the science community may encourage reviewers and panels to reward risk and innovation.	Appropriate
4. Does the program portfolio include inter- and multi-disciplinary projects? Comments: The establishment of targeted research programs (SHINE, GEM, CEDAR) over the past few decades within the geospace core programs has successfully and effectively marshalled individual scientists to collaborate and contribute to intra-disciplinary research. However, as noted above, interdisciplinary and multidisciplinary research incorporating two or more of the current "stove-pipes" has not been, in general, very successful. While joint meetings of SHINE and/or Gem and /or CEDAR have happened, and are planned, it is generally agreed that inter- and multi-disciplinary projects are imposed, not naturally sought. NSF Geospace personnel recognize this and are attempting to promote new projects that cut across the established (entrenched?) disciplines. The proposed establishment of the Integrated Geospace Systems program epitomizes this. Achieving robust and substantial multi-disciplinary geospace research will likely require ongoing, concerted effort by NSF to actively "push" communities, comfortable in their stove-pipes, into new multidisciplinary directions.	Appropriate

5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? Comments: Yes. Both in terms of proposals submitted and awards made, there is general geographical diversity. But, as noted above, the geographical distribution is better assessed in terms of relative, rather than absolute terms. Clearly, not all regions of the USA have geospace science programs – rather there are centers where Universities, sometimes in concert with other universities and government Labs, are the principal practitioners. Future COVs may be better able to respond to this type of question if the question itself were better formulated so as to express NSF's motivation for securing "appropriate geographical distribution". What exactly does NSF deem "appropriate"? For example, is uniform geographical distribution sought, or desirable? If so, should awards be made, over time, to "all" geospace research institutions across the USA? Or is the intent to flag unexpectedly large funding of a particular institution? Is NSF seeking to expand geographical coverage in support of training and education?	Appropriate
6. Does the program portfolio have an appropriate balance of awards to different types of institutions? Comments : The awards to different types of institutions are remarkably well balanced across the 4 types (namely Masters, PhD, Research Intensive PhD, and Business/State/Local/Other). None has a majority, with research intensive PhD institutions accounting for 43% of awards and Masters degree granting institutions exceeding 10% of awards, in contrast with other Geospace Programs which all had research intensive PhD institutions with a majority of awards and all had 10% or less of awards to Masters degree institutions.	Appropriate

7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? NOTE: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award. Comments: NSF actively encourages and motivates new and early-career investigators and in recent years the number of awards to this group increased substantially, now accounting for greater than 30% of awards. This indicates a healthiness in attracting new people to the field. But it does not guarantee that they stay on the field; achieving this high rate may be making it more difficult to maintain an acceptable award rate for mid- to late-career investigators. Eventually, early-career investigators transition to mid-career, at which point, lacking the opportunity for funding, they may transition to other fields, thereby mitigating, to some extent, the original intent of encouraging and motivating young scientists in geospace research. There is no breakdown of awards for mid-late career investigators. Nor is it clear if NSF has a definition for such categories, or if it has considered the topic within the broader context of the particular percentage mix of early-, mid- and late-career scientists that constitutes a healthy and vibrant research community.	Data not available
8. Does the program portfolio include projects that integrate research and education? Comments: Yes. Many of the awards included broader impacts that integrate research and education. STR is funding educational and public outreach through the various ground-based facilities and through both academic and non-profit organizations. STR has also funded NASA (CCMC) to promote education and outreach.	Appropriate

9. Does the program portfolio have appropriate participation of underrepresented groups[1]? Comments: Under-represented groups remain a challenge for STR. There are examples of the program officer striving hard to ensure participation is as high as possible. However, the real issue is the broader pool of under-represented groups in science. NSF is working with HBCU's and has a robust program with Arecibo, but participation by under-represented groups remains anemic. Greater outreach to the Hispanic community is one area where we could not find any targeted NSF programs, beyond the Arecibo program.	Not appropriate
10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. Comments: Yes. The program is being responsive to national priorities such as the National Space Weather Strategy and National Space Weather Action Plan (SWAP) via addressing benchmarks (SWAP Goal 1), by addressing the operations-to-research and research-to-operations issue with a Dear Colleague Letter (SWAP Goal 5), and by soliciting the community for research priorities consistent with the Strategy (SWAP Goal 5).	Appropriate

11. Additional comments on the quality of the projects or the balance of the portfolio: A particular and unique aspect of the STR program is NSF's ongoing support for the BBSO facility, in collaboration with the NJIT. This program has produced, over past decades, excellent scientists and cutting edge solar observations and research; it remains a fundamental component of solar research in the USA. It is, for example, actively deploying and testing new instrumentation prototypes for the DKIST. Currently, NSF requires the BBSO to submit a proposal for research over a 5-year period. The duration and breadth of the research requires large funding– hundreds of $K per year -relative to the typical NSF grant and these differences of funding level and duration make it less amenable to "normalizing" by the typical review methods. The COV discussed whether the BBSO might be properly considered a "facility" and thus moved to that jurisdiction from STR.	

[1] NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

OTHER TOPICS

1. Please comment on any program areas in need of improvement or gaps (if any) within program areas.

The FDSS program has been ad hoc, with the program being offered only when the overall section budget allowed. While this is entirely understandable, perhaps the program could be modified to allow a more consistent offering. One suggestion would be to create lower-cost alternatives (such as support for start-up packages) to provide incentives for Universities to create new positions.

2. Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.

3. Please identify agency-wide (i.e., outside NSF) issues that should be addressed by NSF to help improve the program's performance.

As seen from the outside, current procedures for ensuring lack of COI seems to be creating challenges for the Section. The COV encourages NSF to explore new ways to satisfy the intent of COI restrictions while enabling Program Officers to do their jobs effectively. One suggestion would be to allow Program Officers and reviewers to self-report the nature of collaborations that could result in a perceived COI, while in fact none exists.

4. Please provide comments on any other issues the COV feels are relevant.

5. NSF would appreciate your comments on how to improve the COV review process, format and report template.

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SIGNATURE BLOCK:

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For the Geospace CV
Robert McCoy
Chair