CORE QUESTIONS and REPORT TEMPLATE
for
FY 2020 NSF COMMITTEE OF VISITOR (COV) REVIEWS

Guidance to NSF Staff: This document includes the FY 2020 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2020. Specific guidance for NSF staff describing the COV review process is described in the "COV Reviews" section of NSF's Administrative Policies and Procedures which can be obtained at https://inside.nsf.gov/tools/toolsdocuments/Inside%20NSF%20Documents/Policy,%20Procedures,%20Roles%20and%20Responsibilities%20for%20COV%20Reviews%20and%20Program%20Portfolio%20Reviews.pdf[1].

NSF relies on the judgment of external experts to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. COV reviews provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations; and (2) program-level technical and managerial matters pertaining to proposal decisions.

The program(s) under review may include several sub-activities as well as NSF-wide activities. The directorate or division may instruct the COV to provide answers addressing a cluster or group of programs – a portfolio of activities integrated as a whole – or to provide answers specific to the sub-activities of the program, with the latter requiring more time but providing more detailed information.

The Division or Directorate may add questions relevant to the activities under review. Copies of the report template and the charge to the COV should be provided to OIA prior to forwarding to the COV. In order to provide COV members adequate time to read and consider the COV materials, including proposal jackets, COV members should be given access to the materials in the eJacket COV module approximately four weeks before the scheduled face-to-face meeting of the COV members. Before providing access to jackets, the Conflict of Interest and Confidentiality briefing for COV members should be conducted by webinar, during which, NSF staff should also summarize the scope of the program(s) under review and answer COV questions about the template.

Suggested sources of information for COVs to consider are provided for each item. As indicated, a resource for NSF staff preparing data for COVs is the Enterprise Information System (EIS) –Web COV module, which can be accessed by NSF staff only at http://budg-eis-01/eisportal/default.aspx.   In addition, NSF staff preparing for the COV should consider other sources of information, as appropriate for the programs under review.

For programs using section IV (addressing portfolio balance), the program should provide the COV with a statement of the program's portfolio goals and ask specific questions about the program under review.   Some suggestions regarding portfolio dimensions are given on the template.   These suggestions will not be appropriate for all programs.

Guidance to the COV: The COV report should provide a balanced assessment of NSF's performance in the integrity and efficiency of the ***processes*** related to proposal review. Discussions leading to answers of the Core Questions will require study of confidential material such as declined proposals and reviewer comments. ***COV reports should not contain confidential material or specific information about declined proposals.*** The reports generated by COVs are made available to the public.

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[1] This document has three parts: (1) Policy, (2) Procedures, and (3) Roles & Responsibilities.

We encourage COV members to provide comments to NSF on how to improve in all areas, as well as suggestions for the COV process, format, and questions. For past COV reports, please see http://www.nsf.gov/od/oia/activities/cov/.

FY 2020 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: March 30 – April 1, 2020
Program/Cluster/Section:
Division: Division of Atmospheric and Geospace Sciences
Directorate: Geosciences
Number of actions reviewed: 239 **Awards: 121** **Declinations: 114** **Other: 4**
Total number of actions within Program/Cluster/Division during period under review: 2177   **Awards: 966**   **Declinations: 1,188** **Other: 23**
Manner in which reviewed actions were selected: **Using NSF Electronic Information Systems a complete list of actions was assembled. This was the first time the COV covered the different years. For the Atmospheric Sciences Section the review covered 2016-2019. For the Geospace Section the review covered 2018-2019. For the NCAR and Facilities section it covered 2016-2019. From this list of actions the following actions were removed from the full list: IPA/Rotator grants, supplements, forward funding actions, and purchases.** **Unless program had a small number of jackets a random sample of 9% of jackets was produced and then augmented with small number of additional jackets provided by the Program Officers. The summary table below shows the break down per program.**

Table – Program Actions and COV sample set details

Program	Section	COV Period		Sample Composition	
		Actions	Awards	Actions	Awards
AER	GS	132	54	15	7
ATC	AS	368	189	38	19
CLD	AS	460	203	47	26
COMP	NFS	5	4	4	4
EDU	NFS	41	24	8	6
GFS	GS	47	18	6	4
LAOF	NFS	2	2	2	2
MAG	GS	60	29	9	7
NCAR	NFS	1	1	0	0
PCP	AS	233	120	26	12
PDM	AS	614	232	60	20
PRF	AGS-wide	57	19	6	3
STR	GS	57	32	6	4
SWR	GS	100	39	12	7
Grand Total		**2177**	**966**	**239**	**121**

COV Membership

	Name	**Affiliation**
COV Chair or Co-Chairs:	Dr. Kaatje Kraft	Whatcom Community College
COV Members:	Dr. Akua Asa-Awuku	University of Maryland College Park
	Dr. Robert Banta	CIRES and NOAA Earth System Research Laboratories
	Dr. Margaret Chen	Aerospace Corporation
	Dr. Jennifer Comstock	Pacific North West National Laboratory
	Ms. Robbie Hood	Blue Thunderbird LLC
	Dr. Christina Karamperidou	University of Hawaii at Manoa
	Dr. Judith Karpen	NASA Goddard Space Flight Center
	Dr. John Mathews	Pennsylvania State University
	Dr. Hansi Singh	University of Victoria
	Dr. Scott St. George	University of Minnesota
	Dr. Michael Winton	NOAA Geophysical Fluid Dynamics Laboratory
	Dr. Endawoke Yizengaw	Aerospace Corporation

MERIT REVIEW CRITERIA

An understanding of NSF's merit review criteria is important in order to answer some of the questions on the template. Reproduced below is the information provided to proposers in the Grant Proposal Guide about the merit review criteria and the principles associated with them. Also included is a description of some examples of broader impacts, provided by the National Science Board

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.

- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These broader impacts may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.

- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities. These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.C.2.d.(i) contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.C.2.d.(i), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit**: The Intellectual Merit criterion encompasses the potential to advance knowledge; and

- **Broader Impacts**: The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to:
   a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
   b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

3. Examples of Broader Impacts

The National Science Board described some examples of broader impacts of research, beyond the intrinsic importance of advancing knowledge.[2] "These outcomes include (but are not limited to) increased participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education at all levels; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a globally competitive STEM workforce; increased partnerships between academia, industry, and others; increased national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education. These examples of societally relevant outcomes should not be considered either comprehensive or prescriptive. Investigators may include appropriate outcomes not covered by these examples."

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[2] NSB-MR-11-22

Basic Approach & Virtual Experience

After two pre-meeting webinars, the Committee of Visitors (COV) divided up questions from the template prior to meeting for the COV. During the COV we used Zoom, which has overall worked incredibly well. The COV appreciates NSF's willingness to try a new method to make this process work more smoothly --despite the inability to meet in person. As a result, the COV has been able to discuss issues in small groups, breakout rooms, and work online with a shared document site.

Merit Review Process

Reviews are capturing the intellectual merit of programs overall. Broader impacts are considered with varying levels of consistency, but the program officers (POs) are working to make sure both components are considered in the review process.

One suggestion to help deepen the pool of reviewers was for NSF to send annual letters to administration/ supervisors of institutions (academic and non-academic) that indicate the value of these reviews and thank individuals at those institutions for their service.

Reviewers Process

Given the challenges of finding reviewers, POs are doing a laudable job of finding qualified and appropriate reviewers without conflict of interest (COIs). The COV found no evidence of COI concerns.

Management of Program

The COV was impressed with the consistent and dedicated work of the program officers. All POs are managing many moving parts, including staying up-to-date on the scientific literature covering a substantial breadth of subdisciplines, attending scientific meetings, coordinating site visits, collaborating across funding agencies, and still managing to find ways to ensure a broad representation of state-of-the-art research across the many areas encompassed by their programs. Some program officers receive over 100 proposals per year, and are required to be familiar with each proposal in order to select reviewers, perform an adequate Review Analysis, and come to a fair funding decision.

The COV recommends that, in order to ensure that individual programs have a measure of continuity across expected turnover of program officers, PO staffing levels should be increased. The AGS division relies on mentorship to bring rotating program officers up to speed on agency procedures and protocols, and it is reasonable to expect that each program within AGS have a permanent program officer. Some larger programs would benefit from having 2 permanent POs along with a rotating program officer. Smaller programs would benefit from more permanent and temporary assistance.

Each program within AGS has unique strengths. The COV recommends that cross pollination of successful strategies from specific AGS programs can be applied throughout AGS to research prioritization and the broadening of diversity among researchers within each discipline.

Portfolio

The ad-hoc, bottom-up approach to portfolio balance, without further intervention by NSF, seems to be working successfully. The COV does not recommend any change in procedure here.

The COV agrees that the size and duration of awarded projects were appropriate across AGS. AGS clearly supports innovative projects. Examples of effective programs that explicitly promote innovative research include EAGER, RAPID, IdeasLab (e.g., Cross-Cutting Initiative in CubeSat Innovations), and Faculty Development in Space Sciences. Transformative projects are easier to identify retrospectively.

The COV commends AGS for their efforts and success in promoting inter- and multi-disciplinarity both within and outside AGS. The COV observes that the AGS program directors are making good-faith efforts to maintain program portfolios with appropriate geographical distributions, and with appropriate attention to nurturing new and early-career researchers.

Broadly speaking, AGS statistics show that an appropriate balance of awards was distributed between educational institutions and private research institutions. In order to increase collaborations with government scientists, the COV recommends more multi-agency funded solicitations.

Other

The COV members thanks the AGS program directors and officers for the extensive volume of information provided to the COV in the weeks prior to the meeting (the self-study report was an incredibly needed and valuable document for us in our process), and for the real-time generation of additional data products requested by the COV during the meeting.

INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

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 general, the COV finds the review methods to be appropriate. For most of the proposals examined, reviews were either ad hoc, panel, or a combination of ad hoc and panel. No site visits were described. Some members expressed concern regarding whether proposals may be advantaged or disadvantaged depending on the review modality, and how the review modality was chosen by program officers. Other members noted that, in some Programs, ad hoc reviews were employed on occasion when panel reviews were inconclusive, or when the appropriate expertise was not available on the panel. In some Programs, program officers described in their Review Analysis reports why a particular review modality (panel, ad hoc, or combination) was chosen, although such details were neither found for all proposals nor consistently available for all Programs. **Data Source: EIS/Type of Review Module**	YES

Are both merit review criteria addressed
 	
   a) In individual reviews?
 	
   b) In panel summaries?
 	
   c) In Program Officer review analyses?
 	
 Comments:
	A) YES
	
	B) YES
	
	C) YES

In general, the COV finds that both merit criteria are given close attention at all levels of review. The panel summaries and review analyses explicitly addressed Intellectual Merit and Broader Impacts (BI) in all cases, although some individual reviews neglected to provide comments about the latter. Across all programs, most proposals that did not receive funding were declined due to problems associated with limited Intellectual Merit. Conversely, several proposals were selected for funding on the strengths of their Intellectual Merit, despite having either limited or poorly articulated Broader Impacts. Because the COV also noted cases where proposals were awarded funding on the strengths of their Intellectual Merit and the past productivity of the Principal Investigator, the COV concludes that the Broader Impacts criterion plays only a secondary role in the proposal assessment process for most programs. The COV notes that the EDU program was able to support projects with exceptionally strong BI, largely due to efforts by the program officers to encourage applicants to address intellectual weaknesses identified by reviewers or panels. **Data Source: Jackets**	

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? Comments: The individual reviews span a wide range of depth. Some reviewers provide substantive and detailed comments, whereas others do not. Towards improving consistency of quality amongst the reviews and diversity of reviewers, the COV suggests, to the extent possible, that AGS maintain a central database of the reviewer pool that can help to track the quality of their reviews. This would allow the POs to keep track of repeat and brand new reviewers, how often the same people been asked to serve, what factors determine whether a reviewer is or is not invited back, and whether proposers raise issues with particular reviews. In addition, if this database contains information about reviewer demographics, AGS can work to assure the diversity of the reviewer pool, to the extent allowed by law. **Data Source: Jackets**	YES
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: The COV finds that the panel summaries from both mail-in and panel reviews captured the rationale for panel consensus. The COV notes that the panel summaries were on occasion distinct from individual reviews, but still reflected the majority consensus.	YES

Data Source: Jackets	
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 COV was impressed with the quality of the rationales from the program officers (POs). In some instances where a review panel/set of reviews was on the fence, the PO sought additional input in order to support potentially transformative proposals; that input helped the COV to see the PO's thought process. Some of the in-house decisions (e.g., EAGER) did not necessarily have the same transparency, however, so the COV recommends that the PO provide at least a memo in the jacket that indicates how the decision was made to award/decline. **Data Source: Jackets**	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: In general, the COV finds that the documentation to the PI adequately explains the rationale for the award/decline decision. **Data Source: Jackets**	YES
7. Additional comments on the quality and effectiveness of the program's use of merit review process: The success of the merit review process is highly dependent on the willingness of experts within the community to serve as ad hoc and/or panelist reviewers. The review process requires considerable voluntary time and effort, which are not always afforded or recognized in the wider community including government labs, private companies, etc. In order to more proactively engage the wider community, the COV recommends that the AGS Director send an (annual) letter of appreciation to heads of all participant institutions. This letter would promote the role of NSF national and global science and highlight the importance of the expert peer-review process in selecting innovative and well-balanced scientific portfolios that ultimately benefit the whole community and the nation. The COV hopes that these letters of appreciation would motivate institutions to recognize, reward, and perhaps compensate their experts, who should be identified by name in these letters if possible. Further, each reviewer should be individually acknowledged for their participation in a letter from the AGS director and co-signed by the appropriate PO(s). This letter should explicitly identify the circumstances of the reviewer participation including program names, panel type and dates, etc. The COV invites NSF to consult the community on the content of the letter.	

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 COV finds that all programs in the AGS section obtained reviews from experts who are active researchers within their respective fields. For programs that incorporate panels into their decision process, those bodies were very well constructed with respect to subject expertise, gender, and career stage. The COV also notes that panels made good use of ad-hoc reviews solicited by Program Officers to supplement the panel reviews. **Data Source: Jackets**	YES
2. Did the program recognize and resolve conflicts of interest when appropriate? Comments: The COV finds that conflicts of interest were appropriately identified, investigated, and resolved across the AGS Section. Furthermore, several programs erred on the side of precaution and decided not to use non-COI potential reviewers with historical connections. **Data Source: Jackets**	YES
3. Additional comments on reviewer selection: Occasionally there were two or three reviewers from the same institution for one proposal or on one panel. The COV recommends avoiding this situation in the future when requesting reviews. Overall, the sets of reviewers for AGS programs had an adequate balance of men and women.	

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

MANAGEMENT OF THE PROGRAM UNDER REVIEW

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1. Management of the program.

Comments:
The COV is impressed with the Program Officers' managerial performance including the dynamic range of their responsibilities, attention to detail, and alacrity. The programs generally are working well, and the COV expects that outstanding AGS-sponsored research and educational work will continue. The COV asked the AGS Program Officers (POs) to compare the use of accepting unsolicited proposals with no deadlines with releasing targeted solicitations with submission deadlines. Many of the AGS POs supported the implementation of accepting unsolicited proposals with no deadlines, when appropriate for the management of their programs. The POs stated that their workloads had been reduced and more evenly distributed in time with implementation of no-deadline proposals, largely because they received fewer proposals each year. They also noted that the quality of the proposal submissions had improved because the proposers were not working against a deadline, and that the quality of the proposal reviews had improved because the POs had more time to find suitable, capable reviewers.

Recommendations:

The COV recommends that AGS continue to accept unsolicited proposals with no deadlines. The COV also recommends that, in order to ensure that individual programs have a measure of continuity across expected turnover of program officers, it would be useful to increase PO staffing levels. The AGS division relies on mentorship to bring rotating program officers up to speed on agency procedures and protocols, and it is reasonable to expect that each program within AGS have a permanent PO. Some larger programs would benefit from having 2 permanent POs along with a rotating program officer. The COV recommends that several programs be highlighted. For example, the CubeSat program is particularly impressive, a large, high-risk/high-reward program that is challenging to manage and yet well done.

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

Comments:

The COV is greatly impressed by the active and positive efforts by the Program Officers (POs) to encourage Principal Investigators to construct projects that address multiple priorities shared across several AGS programs. The Division is particularly complimented for its efforts to create a portfolio of potentially transformative projects by sharing funds between partner programs. The Division has facilitated creative opportunities for education, e.g., by funding international summer schools for undergraduate and graduate students, supporting a revolving set of workshops, and communication training for senior scientists. The COV encourages POs to continue their support of education and training related to AGS priorities, and to offer a range of activities for students and scientists at all career stages. The COV noted the dearth of information regarding the career paths of students and post-docs who are supported directly by AGS funding. The COV appreciates that the issue of

training efficacy cuts across many or most NSF programs, but also encourage AGS staff to identify useful approaches to determine whether junior scholars funded by AGS programs are transitioning into positions within science, technology, or education fields. In this regard, AGS should investigate how trainee outcomes are tracked by other federal and foreign science agencies.

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

Comments:
Each program within the AGS Division has unique research planning and priorities, and thus novel opportunities for growth. On one hand, the presence and continuity of more established programs are necessary and continue to provide critical research support. For example, the ongoing funding of complex community data and models has been largely beneficial to the community. On the other hand, the steady inclusion of new/innovative and transformative research projects maintains a healthy mix of established and novel projects, as reflected in the portfolios and our conversations with the AGS staff.

The COV finds that all programs recognize the crucial need to increase a broader range of diversity and reduce underrepresentation across the AGS disciplines in awards and future researchers. Some programs have made efforts toward this goal, and others may need to consider how to set actionable goals and plans in order to achieve this larger goal. Some programs within AGS have developed guidelines and documentation to foster and build more diverse arrays of researchers and programs. An impressive outcome of recent awards in certain programs has been enhanced diversity (female, ethnically Hispanic, and African-American scientists). Such planning can be applied to disciplines that lag in diversity. Specifically, these programs should develop action items to achieve particular diversity goals, and learn from and leverage the demonstrated success of other programs within the Division and Directorate.

The COV recommends that cross-pollination of successful strategies from specific AGS programs should be applied to research prioritization as well. Notably, the National Academy of Sciences, Engineering, and Medicine (NASEM) published consensus reports in multiple fields that describe compelling research strategies and identify where additional investments in research infrastructure could best advance scientific understanding in those fields. Such reports could be used by AGS to increase funding and support in recommended areas. The COV also recommends that other AGS programs consider this route for seeking external perspectives from a wide sampling of professionals.

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

Comments:
The COV struggled to accurately capture a response to this at a Division-wide level because previous COVs have reviewed at a sectional/programmatic level and, as such, have a vast array of comments and responses. In general, those recommendations that are within the AGS capacity have been responded to, and sometimes resulted in changed practices.

The largest big-picture challenge that emerged, which this COV continues to encourage AGS to work on, is the issue of Broader Impacts. The 2018 COV report recommended "finding ways to communicate this (sic broader impact) information to a wider audience at meetings and elsewhere such as webinars." The AGS response was very positive, with several good ideas and action items. These actions to communicate the broader impacts of AGS research may need to continue, as some proposers and write-in reviewers do not address the broader impacts at all.

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 sub-disciplines of the activity? Comments: Among and within those NSF divisions that rely on unsolicited proposal submissions, the balance in research topics is determined by the distribution of incoming proposals that reviewed well enough to warrant funding, a so-called 'bottom-up' approach. NSF may monitor long-term trends in these distributions over periods of several years, but no active measures are pursued, or have been needed, to maintain a reasonable balance. For example, in the analysis of subdiscipline trends over 13 years for one program (PDM) for which this information was available, the COV finds that a reasonable balance among funded proposals was achieved with respect to larger vs. smaller scales. Importantly, a good balance is also found between observational and Numerical Weather Prediction (NWP) modeling projects submitted and funded—models are now an important aspect of nearly all meteorology-related activities from research to operations and forecasting, but comprehensive measurement efforts are critical to evaluate how well they are doing and to improve them. trends over 13 years for one program (PDM) for which this information was available, the COV finds that a reasonable balance among funded proposals was achieved with respect to larger vs. smaller scales. Importantly, a good balance is also found between observational and NWP modeling projects submitted and funded—models are now an important aspect of nearly all meteorology-related activities from research to operations and forecasting, but comprehensive measurement efforts are critical to evaluate how well they are doing and to improve them. Some smaller programs had too few proposals to draw any conclusions about balance. Among those Divisions having larger samples of funded proposals (e.g., PDM, ATC, AER, PCP, and CLD), the COV found a reasonable balance of subdisciplines. **Recommendation:** The bottom-up approach to portfolio balance without further intervention by NSF seems to be working, so the COV does not recommend any change in procedure here. **Data Source: EIS/Committee of Visitors Module. From the Report View drop-down, select the Funding Rate module to see counts of proposals and awards for programs. The Proposal Count by Type Report View will also provide a summary of proposals by program.**	APPROPRIATE

2. Are awards appropriate in size and duration for the scope of the projects? Comments: The COV finds that the size and duration of awarded projects were appropriate across AGS. The Program Officers make adjustments to proposal budgets as needed, and large budgets tend to coincide with field campaign costs or large collaborative proposals. These awards were reasonable and appropriate given the scope of the work. **Data Source: EIS/Committee of Visitors Module. From the Report View drop-down, select Average Award Size and Duration.**	APPROPRIATE
3. Does the program portfolio include awards for projects that are innovative or potentially transformative? Comments: The COV finds that AGS clearly favors innovative projects: declined proposals are twice as likely as awarded proposals to be deemed non-innovative by reviewers across AGS. The reviewers correctly identified many proposals as innovative, and the Review Analyses show that Program Officers often gave more weight to positive than negative reviews for proposals exhibiting innovative thinking. The ratio of innovative to non-innovative proposals varies from program to program, depending on the type of research being funded and the subjective judgement of the reviewers. Examples of effective programs that explicitly promote innovative research include EAGER, RAPID, IdeasLab (e.g., Cross-Cutting Initiative in CubeSat Innovations), and Faculty Development in Space Sciences. NSF defines transformative research as: challenges conventional wisdom, leads to unexpected insights that enable new techniques or methodologies, and/or redefines the boundaries of science, engineering, or education. Although the reviewers noted the <u>potential</u> for transformative results in a few proposals, the COV notes that transformative work is most likely to be identified only in hindsight. The AGS management, and hence future COVs, could assess the fraction of transformative awards better by reviewing final and other reports for previously funded and completed projects. **Data Source: Jackets**	APPROPRIATE
4. Does the program portfolio include inter- and multi-disciplinary projects? Comments: Co-funding statistics support the COV's conclusion that the overall culture of collaboration, as well as the management system for awards within and outside AGS, are conducive to the development of inter- and multi-disciplinary projects. The COV found that AGS encourages and supports inter- and multi-disciplinarity at multiple levels, aided by the inherent multi-disciplinarity in geosciences: both PIs and POs have the opportunity to	APPROPRIATE

determine interdisciplinarity and seek co-funding when appropriate before or after submission of a proposal. Co-funding activities exist between many AGS programs within the Geosciences Directorate and outside the Directorate (e.g., P2C2) that foster interdisciplinarity. Inter-agency collaborations also foster inter- and multi-disciplinarity, e.g., CLD and SWR coordination with DOE, NOAA, ONR, and NASA, and long- and short-term multi-agency climate research planning under the auspices of U.S. Global Research Program (USGCRP). **Recommendation:** The COV commends AGS for their efforts and success in promoting inter- and multi-disciplinarity both within and outside AGS. The COV finds that the bottom-up approach that is generally adopted within AGS naturally leads to an appropriate level of interdisciplinarity, which is at approximately 19% when using co-funding rates as a proxy, and thus recommends continuing these practices. The COV encourages more multi-agency collaborations in the spirit of promoting inter- and multi-disciplinarity and addressing the needs of the AGS community (e.g., for data collection, monitoring, modeling, applied research, and theory development). *Note: For the purposes of this question, the COV defines multi-disciplinarity as drawing knowledge and practices from different disciplines while staying within their boundaries; inter-disciplinarity is defined as synthesizing principles, methods and practices between disciplines in a coordinated and coherent manner.* **Data Source: If co-funding is a desired proxy for measuring inter- and multi-disciplinary projects, the Co-Funding from Contributing Orgs and Co-Funding Contributed to Recipient Orgs reports can be obtained using the EIS/Committee of Visitors Module. They are available as selections on the Report View drop-down.**	
5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? Comments: The COV finds that the AGS Program Officers are making good-faith efforts to seek appropriate geographical distribution of funded projects within the program portfolios. **Recommendations:** The AGS Program Officers should continue to promote developing collaborations with EPSCoR states when appropriate, and reach out to a variety of geographically distributed institutions through attendance at national scientific conferences. Travel funding for Program Officers to attend such conferences should continue to be an AGS budget priority. **Data Source: EIS/Committee of Visitors Module. Select Proposals by State from the Report View drop-down.**	APPROPRIATE
6. Does the program portfolio have an appropriate balance of awards to different types of institutions?	APPROPRIATE

Comments : Broadly speaking, AGS statistics show that an appropriate balance of awards was distributed between educational institutions and private research institutions. A large proportion (> 90%) of proposal submissions and awards was given to PhD-granting institutions and other academic institutions compared to 10% given to non-academic (or private) research institutions. A visual comparison of the charts shows significant similarity, which indicates equivalent funding rates across institution types. **Recommendation:** Because NSF is not allowed to provide support to scientists from government research labs, which became a barrier for collaboration between universities and government research labs on NSF-funded major projects, the COV recommends more NASA and NSF jointly funded project calls for every funding cycle. This reduces the barriers significantly because, while NASA provides funding for scientists from government labs, NSF will fund researchers from academic or private research institutions. **Data Source: EIS/Committee of Visitors Module. Select Proposals by Institution Type from the Report View drop-down. Also, the Obligations by Institution Type will provide information on the funding to institutions by type.**	
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: The COV finds that AGS supports new and early-career investigators with post-doctoral fellowships, CAREER awards, and regular awards. AGS is commended for reinstating its Postdoctoral Fellowship Program. Because of their long duration (5 years), CAREER proposals have somewhat lower funding rates than other programs in AGS. CAREER applicants are sometimes redirected toward the more standard, shorter-term proposals that are easier to plan. The overall fraction of awards to early-career scientists is only slightly lower than their fraction of total actions. In addition, the number of awards over time rises sharply in the first 10 years since degree, indicating significant encouragement and attention to professional development by AGS for this cohort. The similarity of early-career success rates to the overall statistics, in spite of the relative inexperience of the proposers, indicates a level of support from AGS program officers that is deemed appropriate by the COV.	APPROPRIATE

Data Source: EIS/Committee of Visitors Module. Select Funding Rate from the Report View drop-down. After this report is run, use the Category Filter button to select New PI for the PI Status filter or New Involvement (PIs & coPIs) = Yes.	
8. Does the program portfolio include projects that integrate research and education? Comments: Certain programs within AGS (e.g., REUs, outreach programs, CAREER projects, CubeSat, SOARS, and the postdoctoral program) include educational foci by design. Within each program, the COV finds appropriate support for CAREER proposals, which specifically integrate education and research. Budget allocations for students and postdocs in proposals by educational institutions are appropriate, and funds for student participation in scientific conferences should be encouraged. In proposals outside of the aforementioned programs, PIs often include educational activities as part of the broader impacts, in the form of curriculum development, outreach activities, workshops, etc. By deeming the Broader Impacts as a merit review criterion of equal importance with the intellectual merit criterion, NSF as a whole encourages integration between research and education (within each institution or in society). The COV concludes that AGS awards are mostly consistent with this important principle. **Data Source: Jackets**	APPROPRIATE
9. Does the program portfolio have appropriate participation of underrepresented groups[3]? Comments: The COV finds that AGS award rate is representative of the field as a whole. By comparing submission and award rates with national statistics for PhD graduation rates for women and minorities, the COV verified that these data are consistent. The COV commends the collaboration of AGS with other NSF programs such as NBCU, MSI, and SOARS that target diversity, and recommends that AGS expand these collaborations and outreach efforts to continue to increase proposal submission numbers for underrepresented groups. Tracking this information from year to year will also help future COV reviews to assess growth over time. **Data Source: EIS/Committee of Visitors Module. Select Funding Rate from the Report View drop-down. After this report is run, use the Category Filter button to select Women Involvement = Yes or Minority Involvement = Yes to apply the appropriate filters.**	APPROPRIATE

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[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.

10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. Comments: The COV finds that the AGS mission statement and the types of investigations contained in this portfolio are fully consistent with the recommendations of NASEM documents such as the 2013 Heliophysics Decadal Survey and its recent midterm review, the 2016 The Future of Atmospheric Chemistry Research report, the 2016 Next Generation Earth System Prediction report, and the 2016 Subseasonal-to-Seasonal Forecasting report; the NSTC's 2019 National Space Weather Strategy and Action Plan; Congressional legislation such as the US Weather Research and Forecasting Innovation Act of 2017 and the Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow (PROSWIFT) Act of 2020. Therefore, the COV concludes that the AGS program is highly relevant to NSF's primary goals, the AGS community, and national priorities. **Data Source: Jackets**	APPROPRIATE
11. Additional comments on the quality of the projects or the balance of the portfolio: The COV lauds the program officers for good program balance, mix of solicited and unsolicited programs, thoroughness of the eJacket contents, and their responsiveness and prompt data sharing whenever the COV asked for additional data.	

OTHER TOPICS

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

The COV has no suggestions

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.

The COV has nothing to add.

3. Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.

    The COV expressed some concern about whether mechanisms exist for linking outcomes from one funded proposal to the funding of future proposals. While the COV acknowledges that proposals are required to report on previous support for both intellectual merit and broader impacts, there was

some concern that it was possible for individuals to misrepresent their impacts. Of particular note is mentorship of students, which is often an important component of BI statements. Given the lack of representation of women and underrepresented minorities in the geosciences, some COV members suggested that the lack of direct feedback between outcomes from prior proposals and future funding might contribute to disproportionately greater attrition rates of students from such underrepresented groups.

The COV recommends that NSF as a whole develop a clear mechanism for reporting the productivity of individuals who are working with undergraduates/graduates for training of future scientists within communities. Just because one is productive from a publishing standpoint, does not mean this person is a supportive member of the community for preparing the next generation of scientists. While this is not just NSF's responsibility, the COV encourages a component from NSF to take the lead in tackling this challenge. This may start with an investigation of how systemic this issue is, and obtaining the perceptions of relevant individuals in programs as well as those who finished/left programs.

The COV encourages NSF to ensure that reviewers and panelists are in good standing with the community, in line with NSF's policies regarding PIs and co-PIs, as described in Important Notice No. 144, and ODI bulletin No 18-01, NSF.gov/harassment

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

The COV acknowledges that our meeting occurred during the 2020 COVID-19 global pandemic. We were impressed with how hard all of the staff at AGS worked to assure that this process was fairly seamless, successfully making this report possible. However, the COV contends that in-person meetings are still preferable, because the impromptu conversations that occur in person are much more difficult to replicate in an online format.

The development and implementation of new NSF-wide tools to facilitate efficient selection of appropriate reviewers, over the period under review, is an excellent advance that will continue to reduce the workload of the POs.

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

The COV members would like to thank the AGS Program Directors and Officers for the time they spent during the COV meeting to answer questions and to generate real-time data products requested by the COV members. The AGS Program Officers presented real-time information in a forthright manner while being both flexible with their time and nimble in producing additional graphics for discussion.

There is some concern that, while the COV appreciates the importance of getting the larger perspective at a Division level, some of the specificity that occurs at a sectional level in previous reports potentially could be lost.

As a COV, we are incredibly appreciative of the efforts that went into the construction of the Self-Study Report, which was critical for our ability to consider and analyze the work done across the Division. However, the COV recommends that the Self Study Report include a special section highlighting examples of innovative/transformational research from different Programs with time frames to be able to compare research across comparable time frames.

Editing the Sharepoint templates (including this one) online was frustrating for some COV members. It would be helpful for NSF to demonstrate collaboration tools as some reviewers were not familiar with the resources provided.

Some COV members expressed difficulty with the COI feature of the EJacket system. The COV recommends adding instructions for how to input COI in the EJacket system when the COV members are uploading their profile information. Doing this will flag jackets that are from their institution or have PI/CoPI participation as a COI. Later if a COV member starts to look at a jacket and determines that there is involvement of a collaborator on the project, the COV member can add that proposal to the COI list under the proposal section. Also, please identify all collaborative proposals for which each COV member has COIs instead of just the lead proposal. As it currently stands, a collaborative proposal that is not the lead proposal does not explain why a jacket was unavailable, making it look like a computer error.

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SIGNATURE BLOCK:

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For the AGS COV
Kaatje van der Hoeven Kraft
Chair