

Ms. Sandra Cauffman
Director, Earth Science Division
Science Mission Directorate
NASA Headquarters
300 E St SW
Washington, DC 20546

December 15, 2018

Dear Ms. Cauffman,

The Applied Sciences Advisory Committee (ASAC) met in-person in December of 2016 and February of 2018, and via conference call in June, Sept, and October of 2017. The bulk of our discussions and efforts this past year and a half has been to formulate input to the Earth Science Division (ESD) regarding the National Academies' study, *Continuity of NASA Earth Observations from Space: A Value Framework Study* and our formal report on the continuity study is included as an appendix to this letter. During our meetings we have also received excellent briefings on a variety of subjects. Our findings and recommendations are as follows:

ASAC continues to be impressed with the leadership and accomplishments of the Applied Sciences

Program (ASP). ASAC meetings are consistently of high value, in and of themselves, and this latest meeting, February 1-2, 2018, proved no exception. The high-level overview of ASP's recent work in its six application areas: health and air quality, water resources, ecological forecasting, disasters, agriculture and food security, and wildland fires; and their supporting work in the areas of energy, urban development, and transportation/infrastructure highlighted successful, targeted applications of NASA science across a broad swath of the national agenda. NASA ESD and ASP should take satisfaction in this ongoing work with collaborators in government agencies, corporations, and universities domestically and abroad to foster societal uptake of scientific advance.

But to go beyond an individual meeting, to integrate over the ASAC meetings of the past several years, is to see something more significant – namely the arc of this work over the past decade. Early in the period, the emphasis of the work, and the ASAC discussions, were on the individual application efforts, at a tactical level. Over the years, however, Lawrence Friedl and his ASP staff have developed an increasingly structured conceptual/strategic framework for the program. In part this framework has emerged organically from the individual efforts, but more and more the framework is shaping priorities and emphasis for the applied research directions as a coherent whole. The framework hasn't just shaped the internal ASP program. It's influenced the larger ESD effort, and the fuller range of ESD/ASP collaborations with external partners. Despite constrained resources, Lawrence Friedl and ASP have done a remarkable job of adding increasingly robust, high-impact applications dimension to ESD's science.

ASP's maturation is reflected further in its articulation of three lines of business: societal and economic applications; capacity building; and applications in mission planning. This goes beyond mere labels. And the potential for application of NASA science missions, not much more than serendipitous afterthought as recently as a few years ago, is now incorporated into early mission selection and planning.

Continuity study findings. We have reviewed the National Research Council's study, *A Framework for Analyzing the Needs for Continuity of NASA-Sustained Remote Sensing Observations of the Earth from Space*, and prepared a report which is included as an appendix to this letter.

ASAC congratulates the Applied Sciences Program for its commitment to building a culture of collaboration between knowledge producers and knowledge users. ASAC is impressed by the degree to which a collaborative culture is increasingly becoming a part of all Applied Sciences Program activities. To the extent possible we suggest that the Program might consider how to continue to build and formalize this culture, for example through a major conference that regularly brings the Earth science applications community together with the user community to build a shared understanding of experiences, expectations, capabilities, and limitations in both communities. One possible model for such a conference would be the annual conference of DOD's environmental science and technology program, the SERDP and ESTCP Symposium.

ASP is to be commended on its forward thinking which gave rise to the strategic creation of the Valuables Program and the Earth Observations for Food Security and Agriculture Consortium (EOFSAC). These two new large consortia are major steps toward developing high impact collaborative science where NASA investments are clearly identifiable and serve as foundations for wide ranges of science and applications across U.S. and global sectors. These two consortia are now awarded and implemented, serving essentially as functional program offices for two major technical and strategic thrusts for ASP. VALUABLES is focused on establishing the value of earth imagery for applications and developing quantitative analysis of the value of NASA science. The Earth Observations for Food Security and Agriculture Consortium (EOFSAC) is developing a coordinated approach to NASA and others' investment in food security. Both these efforts illustrate a new and powerful approach to ensuring that NASA's data and capabilities are clearly identified as NASA and yet well placed into large scale contexts.

ASAC applauds APS's efforts in communications. In our 2014 and 2015 letters, we emphasized the need for ASP to more fully communicate the value of applications. ASP has placed a significant effort on communications and outreach activities for diverse audiences including the public, the scientific communities, other federal stakeholders, and companies using multiple delivery mechanisms. We've seen effective and increasing use of websites, reports, videos and other social media strategies successfully deployed. An example of this is the Disasters Program website (<https://disasters.nasa.gov>) which was critical for understanding the potential impacts of the 2017 fires, hurricanes, etc. We've seen several successful examples of video series, stories via NASA Twitter and Facebook feeds and high impact reports. We recognize that some of the efforts have been ad hoc, so we are especially delighted that ASP has retained a professional communications firm and an Applied Sciences Communications Manager, and we look forward to reviewing the communications strategy at an upcoming meeting.

APS's Disasters Program has matured into a substantive organization providing critical information to agencies, NGO's and citizens. ASP work in disasters has grown and deepened to the point where other agencies (FEMA, NOAA, USGS) as well as international partners can reliably tap into NASA's novel data sets for practical help in disaster response and recovery. In 2017, this program provided extremely crucial capability through the worst year in history for financial loss to disasters, proving the benefits of past and present investments and setting the stage for continued progress toward pre-disaster resilience and post-disaster response and recovery. The Program's website (<https://disasters.nasa.gov>) was critical for understanding the potential impacts of the fires, floods, hurricanes, and other disasters worldwide.

The frontier in disaster management is to better use integrated insights and lessons learned to reduce risk and to build local to national to global resilience and mitigate new losses to disasters. The role the Program plays in USG disaster response has grown in many dimensions including increased intersections with human dimensions. This means that NASA is now broadly and deeply engaged with frontline disaster response at scale, creating several critical interfaces that must be carefully managed, and new scientific and technical frontiers including reflection of uncertainty. ASAC has the following recommendations:

- The Disaster Program should prioritize the completion of its strategic plan by the summer of 2018 for ASAC review.
- Because the Disaster's Program is in the unique position of documenting how EO are used in the disasters management cycle, we recommend that the Program document lessons learned from each engagement using a standard template (as shown by them during the last meeting) to highlight current success in EO and potential gaps for future missions.
- The Disasters Program should focus on risk reduction and resilience: The frontier in disaster management is to better use integrated insights and lessons learned to build local to national to global resilience and mitigate new losses to disasters. The role the Disasters Program plays in US government disaster response has grown in many dimensions including increased intersections with human dimensions. This means that NASA is now broadly and deeply engaged with frontline disaster response at scale. This creates several critical interfaces that must be carefully managed, and new scientific and technical frontiers including reflection of uncertainty. ASP should partner with social science organizations rather than pursuing these concepts independently.
- The current institutional incentive structure both inside and outside of NASA does not reward many of the elements that are key to maintaining the Program's high impact. For example, a peer reviewed publication is currently valued more than a critical information product during a time of need. Current performance plans/standards need to be reviewed and expanded in a way that allows individuals to maintain career advancement while meeting the expanding unconventional needs of the Disasters program.
- During some disaster related events, ASAC recommends surge support to the Disasters Program to help facilitate timely communications and storytelling.

ASP should fill out the membership of ASAC. ASAC is currently composed of 6 members but has the capacity for 9-10 members. Because of the length of time required to appoint members, ASAC membership has sometimes fallen to as few as 4 members. To maintain its momentum and relevance, we recommend that APS leadership fill out the ASAC membership to maintain a minimum of 8 members.

The ESD Directive on Project Applications Program is a very important accomplishment and framework for assuring and enhancing the public value of Earth Science applications and the Earth Science Division more broadly. ASAC especially wants to call attention to and emphasize its support for the Directive's focus on assessing and meeting the needs of the applications community at the earliest stage of mission project product development (Pre-Phase A), and for the focus on communication and engagement with the "community of practice" throughout all phases of flight project development. ASAC strongly encourages the flight projects to use the various approaches described in Appendix B of the Directive to achieve the Directive's goals, for example, Project Application Workshops, Focus Sessions, Case Studies, and Early Adopter activities.

Moreover, the Committee believes that the value of the QEAO's can be enhanced if their development is integrated with the project development processes from the very beginning (i.e., Pre-Phase A and Phase A). This objective might be effectively pursued through a QEAO workshop development process, perhaps coordinated with major relevant scientific conferences.

Sincerely,



David Saah, ASAC Chair
Kass Green, past ASAC Chair

Cc. Molly Jahn, University of Wisconsin-Madison
Daniel Sarewitz, Arizona State University
David Wilkie, Wildlife Conservation Society
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