Dr. Karen St. Germain
Director, Earth Science Division
Science Mission Directorate
NASA Headquarters
300 E St SW
Washington, DC 20546

August 01, 2022

Dear Dr. St. Germain,

The Applied Sciences Advisory Committee (ASAC) met by video conference in December 2021. During the meeting, we received several exceptional briefings that led to productive discussions on various subjects related to the Earth Science Division's (ESD) and Applied Sciences Program's (ASP) activities. The ESD and the ASP leadership and staff are to be commended on the coordination and content of the ASAC meetings, which the Committee finds well organized, informative, and transparent regarding strengths and challenges. The sessions allowed us to provide advice through ongoing dialogue and give us confidence in the sound management of ESD and the Applied Sciences Program. Our letter report provides a summary of key findings and recommendations. In addition, it includes an appendix that contains a more detailed review of our deliberations regarding several vital topics and our findings and recommendations from these discussions.

KEY HIGHLIGHTS

Recommendation: A diverse funding approach is needed to access a diverse community. The Committee endorses ASP's efforts to expand funding efforts beyond ROSES. It suggests that ESD and SMD pursue a diversity of approaches on the non-flight side that align with the ASP strategic plan.

Recommendation: The Committee encourages Applied Sciences to create visible career-building opportunities for early-career Applications Specialists with backgrounds in spacecraft engineering, instrument design, earth science, social science, systems engineering, science communications, and economics who seek to build career progress in Applied Sciences.

Recommendation: The Committee recommends developing additional reward structures aligned with NASA's Applied Science's strategic goals. The Committee believes that the persistence of standard academic reward structures can be an obstacle to pursuing NASA Applied Science's strategic goals.

Recommendation: The Committee recommends that Applied Sciences continues to explore novel approaches to grant-making and grant reporting requirements that both encourage and enable funding applications from underserved communities. The Committee is particularly concerned about those communities that have been subject to environmental injustice. The Committee believes that through their own investigations using Applied Sciences data, tools, and technology, these underserved communities could press their case for recognition at least and meaningful remediation at best with local, state, and federal authorities. If these underserved communities lack the technical capacity to make the most use of NASA imagery and image analysis technology, these grants might offer training and mentoring opportunities with NASA staff and University grantees.

Recommendation: The Committee encourages NASA to incorporate ethical and privacy elements into its open-source policies, especially as data fusion increases and data latency improves. Adopting a "do-no-harm" approach and minimizing unintended consequences from sharing these data and tools will be essential. Consider existing efforts like the Locus Charter.

On behalf of the ASAC Committee, we are very grateful for the opportunity to provide our advice and recommendations to you and NASA Earth Science. We are also appreciative that NASA has seriously considered prior findings and recommendations. Please contact me if you have any questions about this letter report, and I would be pleased to discuss the findings and recommendations with you.

Sincerely yours,

David Saah
Chair, Applied Science Advisory Committee
Professor of Environmental Science at the University of San Francisco
Principal of Spatial Informatics Group

Cc. Lisa Dilling - University of Colorado
Ed Kearns – First Street Foundation
Albert Anoubon Momo – Trimble Inc.
Rhiannan Price - DevGlobal Partners
Daniel Sarewitz - Arizona State University
Ian Schuler – Development Seed
David S. Wilkie - Wildlife Conservation Society
Danielle Wood – Massachusetts Institute of Technology
Lawrence Friedl, NASA HQ
Julie Robinson, NASA HQ
Emily Sylak-Glassman, NASA HQ

Appendix A: Detailed Meeting Review

TOPIC 1: Earth Science, ESD, and Applied Sciences Program

Finding: The Committee recognizes the effectiveness of the Applied Sciences Program's management approach by setting up clear leads for Applications, Development, and Mission Planning to ensure that attention is paid to each area.

Finding: The Committee applauds the integration of the three new program areas of wildfire, environmental justice, and climate change.

Finding: The Committee applauds efforts to go broader than ROSES in building inclusive scientific communities.

TOPIC 2: Applied Sciences Strategic Plan

Finding: The Committee congratulates the AS team for developing its Strategic Plan and making it accessible to a broad audience.

Recommendation: To fast-track implementation of Equity and Environmental Justice, the team could encourage the Valuables group, Space for the US, and the comms team to create stories that show clearly how Earth Science information can help with Equity and EJ issues.

Recommendation: Continue to designate human capacity to engage in top-priority areas by meeting communities/sectors that NASA seeks to engage. For example, if you want to serve agricultural interests in drought, go to water conservation district meetings, farm bureau meetings, etc. Do this without any agenda, get to know the community, they can learn who NASA/project groups are, and build trust.

Finding: Restructuring the team to unlock more time for the Applied Sciences Director to focus on external communications is a positive development. Showcasing Applied Sciences thought leadership would be critical to realizing the intended impact.

TOPIC 3: ESD Flight Program and Applications

Finding: The Committee applauds the evidence that the Earth Science Division is building strong connections between the programs - including Flight, Earth Science Technology Office, Applied Sciences, Data and Computing, and Research & Analysis. The discussions highlight each of these programs' role in enabling the effective application of earth system information for societal benefit.

Finding: The Committee observes the effort to address connections between the Flight Program and Applied Sciences Program through the Program Applications Lead (PAL). The Committee applauds the Flight Program's early engagement with the Program Application Leads, which provides a dedicated position for ensuring applications are considered early in the mission design process. The Committee notes that through the Program Application Lead efforts, the Earth Science Division has been learning

about the similarities and differences in the requirements for Research & Analysis versus Applied Sciences; this is valuable insight.

Finding: Committee supports the focus on system-level analysis through the Earth System Observatory and notes the value of this systemic approach over the historical emphasis on independent disciplines within Earth Science.

Recommendation: Committee notes that current links between the Applied Sciences Program and Airborne Earth Science seek to identify opportunities for sustained airborne data collection. However, in some cases, the benefit of airborne data collection is to create validation data sets or to improve the application of techniques such as artificial intelligence. Thus, sustainment is not the key need. Instead, the broader vision should invite PIs to describe how either short-term or long-term data collection leads to benefits.

Recommendation: The Committee encourages the Earth Science Division to identify the procedures and practices that will continue to establish the routine for considering applications during the formulation of a mission and evaluate how application opportunities are prioritized when trade studies are carried out. The Committee observes that PALs (Program Applications Leads) will be more effective if integrated and prioritized at the same level as Program Executives and Program Scientists. This factor is pivotal to allowing many of the Applied Sciences Strategic Plan elements and the vision for Open Source Science to be successful.

TOPIC 4: Private Sector Engagement

Finding: The Committee notes that OpenET is an exciting and effective model for ASP to engage with the private sector to solve a demand-driven problem; this approach does not simply deliver data but makes available scientific information and expertise.

Recommendation: Federal employees often do not know the rules of engagement when dealing with questions from the industry. The Committee recommends that ASP develop clear rules for productive engagement with the private sector.

Recommendation: Applied Sciences should document and transparently share its decisions on stakeholder and partner engagement to communicate the rationale.

Recommendation: The Committee encourages the ASP team to embrace rapid cycle learning by conducting After-Action-Reviews (pause and reflect sessions) to explore what ASP private sector engagement hoped to achieve, what worked and why, what did not work and why, and what should we continue, and what must we do differently

Finding: The Committee applauds the report from RTI as the proper approach to initiate private sector engagement.

Recommendation: Committee recommends documenting lessons learned from case studies for scenarios in which a public/private partnership allows the delivery of an Earth Science application to a user community. The lessons learned can explore what types of costs are required to maintain medium

and long-term continuity of the application and what roles the government and private sector play in addressing costs.

TOPIC 5: Reward Structures for Applications

Recommendation: Transaction costs for partners outside of academic structures can be very high--finding ways to encourage the participation of community partners and reduce transaction costs would be valuable.

Finding: The Committee also notes that adjusting rewards structures provides an opportunity to address key diversity, inclusion, and equity issues across those incentive frameworks.

Recommendation: Committee encourages Applied Sciences to engage other donor-oriented organizations and associations to share findings and outcomes from rewards structure evaluations.

TOPIC 7: Applications and Open Source Science

Finding: Committee observes how important it is to define what NASA means by open science to ensure coordinated approaches and a focus on transparency, reproducibility, etc.

Finding: Committee applauds NASA's commitment to Open-Source Science so that all NASA science is transparent, accessible, inclusive, and reproducible.

Recommendation: Committee encourages the Earth Science Division to establish and communicate visible links that potential PIs and private sector collaborators easily understand to show how the Applied Sciences and Earth Science Technology Office cooperate on Open-Source Science. Clarify when it is vital for PIs and potential private sector partners to simultaneously engage with Applied Sciences, ESTO, and the Computing Program.