

Testimony of the
American Geophysical Union

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To the
U.S. House Committee on Appropriations
Subcommittee on Commerce, Justice, Science, and Related Agencies
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Regarding the
**FY2021 Budget Requests for the National Aeronautics & Space Administration,
National Oceanic & Atmospheric Administration, and National Science Foundation**

The American Geophysical Union (AGU), a non-profit, non-partisan scientific society, appreciates the opportunity to submit testimony regarding the fiscal year (FY) 2021 budget request for the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and the National Science Foundation (NSF). **AGU, on behalf of its community of 110,000 Earth and space scientists, respectfully requests that the 116th Congress appropriate the following:**

- **\$7.54 billion for NASA's Science Mission Directorate (SMD),**
- **\$126.85 million for NASA's Office of STEM Engagement,**
- **at least \$6.06 billion for NOAA, and**
- **\$9 billion for NSF.**

AGU's appropriations requests for each respective agency takes into consideration any previous budget cuts and accounts for both inflation and a necessary real four-percent year-over-year growth, to ensure that the U.S. remains at the forefront of research and innovation.¹

National Aeronautics & Space Administration

AGU requests that Congress appropriate \$7.54 billion for NASA's Science Mission Directorate and \$126.85 million for NASA's Office of STEM Engagement; both requests are a 5.71% increase over FY2020. This request will allow NASA to steadily advance existing and new missions while providing unique opportunities for the next generation of STEM

¹ This amount of growth is recommended by the *Innovation: An American Imperative* statement, which was authored by nine large U.S. corporations and endorsed by over 500 leading industry, higher education, science, and engineering organizations from across the 50 states. <https://innovation-imperative.herokuapp.com/index.html>.

professionals and ensure that the U.S. maintains its global leadership in the Earth and space sciences.

Additionally, we request that Congress appropriate equitable funding increases across the science mission areas within NASA's Science Mission Directorate.

Earth Science and Planetary Science Divisions

More than a third of the U.S. economy is affected by climate, weather, and natural hazards. Missions within NASA's Earth Science Division give us greater insight into how our Earth is changing on daily and long-term scales in terms of weather, climate, air quality, water availability, soil nutrients, and other resources. NASA Earth Science produces critical information and data that public and private sector decision-makers, such as farmers, the military, retailers, and emergency managers, use to mitigate the risks and understand the opportunities of the Earth's changes.

A particularly crucial source of Earth science data is our current fleet of Earth observation satellites. Robust funding for Earth Science will allow for the continuation of the Plankton, Aerosol, Cloud, and Ecosystem (PACE) and the Climate Absolute Radiance and Refractivity Observatory Pathfinder (CLARREO Pathfinder) missions. NASA will also be able to implement the recommendations in the 2017 Earth Science Decadal Survey, including carrying out competitively selected missions that address Designated and Earth System Explorer target observables. Competitively selected missions will help to constrain costs and resources, while simultaneously leveraging the talents of a broad array of scientists and universities and advancing our understanding of Earth systems.

NASA's Planetary Science Division is helping to expand our understanding of the universe, approximately 90% of which is still not well understood – even our own solar system. The missions and discoveries of the Planetary Science Division inspire future generations of scientists and STEM professionals to choose science as a career. With appropriate funding, NASA can stay on schedule to launch the next Mars rover and a Europa mission in the 2020s, furthering our understanding of the conditions needed to sustain life. Additionally, robust funding for Planetary Science will allow NASA to pursue human space exploration of the Moon and Mars without sacrificing other decadal priorities, including a balanced portfolio of missions and exploration targets in our solar system.

Earth and planetary sciences are complementary and integrally related to one another. From picking the perfect day to launch a satellite to ensuring that our understanding of other planets is accurate, our knowledge of Earth informs our understanding of other worlds in the solar system. In turn, our exploration of other worlds advances our knowledge of Earth's evolution and processes.

Heliophysics Division

Increased funding for Heliophysics will support the continuation of the Diversify, Realize, Integrate, Venture, Educate (DRIVE) initiative, a top priority of the Decadal Survey. DRIVE will enable investment in novel technologies such as advanced computational tools, establish competitively awarded DRIVE Science Centers, support multidisciplinary

research collaboration using integrated observatory data, and support early career investigators.

Robust funding for the Heliophysics division will accelerate the cadence of alternating Small (SMEX) and Medium-class Explorer (MIDEX) missions, which often accomplish scientific goals for a fraction of the cost of a flagship mission and allow heliophysics researchers to participate and respond rapidly. Increased funding will also advance the Living with a Star mission, including the Space Weather Science and Applications program. This program supports innovation in space weather observational capabilities and advance research-to-operations, operations-to-research, and computational aspects of space weather mitigation. A better understanding of space weather will benefit our space- and ground-based national security assets, aviation systems, power grid, and electric rail systems. Additionally, space weather research plays an important role in safeguarding human health against radiation during long-duration deep space exploration activities.

Office of STEM Engagement

If the U.S. hopes to remain a leader in research and development, it's critical that we continue and expand STEM programs., especially the unique STEM opportunities provided by our federal science agencies. Increased funding for STEM education and opportunities at NASA will directly benefit every state in the nation by providing additional opportunities for STEM students of all ages through Space Grant, Minority University Research and Education Project (MUREP), and Established Program to Stimulate Competitive Research (EPSCoR).

National Oceanic & Atmospheric Administration

AGU requests that Congress appropriate at least \$6.06 billion for NOAA in FY2021, a 13.26% increase over FY2020. From weather forecasts, to fisheries data, to groundbreaking research about the world around us, NOAA provides critical products and services to citizens, planners, emergency managers, and other decision makers when they need it the most. However, NOAA has been severely underfunded in previous spending bills and proposals. Since FY2018, NOAA's funding has been cut by over 8%, and the President's FY2021 proposal would cut the agency's funding by another 13%.

NOAA is essential to our nation's economic stability. In 2019 alone, the U.S. saw 14 major weather and climate disaster events that resulted in \$45 billion in damages and at least 44 deaths. For example, losses from weather-related aviation delays alone are estimated at more than \$1 billion per year, and NOAA drought forecasts are worth up to \$8 billion per year to the farming, transportation, tourism, and energy sectors.² From large corporations to small businesses, the decision-based forecasts provided by NOAA save vital time, money, and resources.

NOAA also plays a unique and vital role in supporting homeland security and national defense. The nation's intelligence community has found that intensifying climate hazards

² NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2020). <https://www.ncdc.noaa.gov/billions/>

are threatening infrastructure, health, and water, and food security—both nationally and globally.³ The Pentagon has reported continuous impacts of climate change on its missions, operational plans, and military installations, including impediments to military testing and training and an increased necessity for maintenance and repairs at dozens of critical military installations.⁴ Without robust funding at NOAA, we risk losing the data needed to make informed and proactive decisions, and our national security will be left in a dangerously vulnerable position.

National Science Foundation

AGU requests that Congress appropriate \$9 billion for NSF in FY2021, an 8.72% increase over FY2020. Ambitious and robust funding for NSF is critical if the U.S. hopes to maintain its leadership in science and technology and reap the economic and national security benefits of that leadership. According to the most recent *State of U.S. Science and Engineering* report, “increasingly, the United States is seen globally as an important leader rather than the uncontested leader.”

NSF accounts for only 4% of federal R&D spending but supports nearly 60% of the nonmedical basic research at our colleges and universities. Research and education programs supported by NSF help increase and develop the knowledge base needed to push the frontiers of science, mathematics, and engineering disciplines, contribute to the development of the future science and technology workforce, underpin new fields of inquiry, and promote interdisciplinary research and education.

Increased funding for NSF will allow the agency to pursue its Ten Big Ideas, including growing Convergence Research and the Inclusion Across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES) program. These two programs will promote transformational science, the first by creating a platform for the integration of multiple science and engineering disciplines to address extremely challenging and complex scientific questions and pressing societal needs; and the second by creating a capable and innovative workforce that reflects the diversity of our nation.

Conclusion

AGU recognizes that difficult decisions must be made within the constraints of the current budget environment and believes that the future of the U.S. is best served by a strong and sustained investment in the full scope of our research enterprise—particularly the sciences and education programs within NASA, NOAA, and NSF. We appreciate this Subcommittee’s leadership in strengthening the nation’s research enterprise. Thank you for your thoughtful consideration of this request and for the opportunity to submit this testimony.

³ Coats, D. R., (January 29, 2019). *Worldwide Threat Assessment of the U.S. Intelligence Community*. <https://www.dni.gov/files/ODNI/documents/2019-ATA-SFR---SSCI.pdf>.

⁴ Office of the Under Secretary of Defense for Acquisition and Sustainment, U.S. Department of Defense, (January 2019). *Report on Effect of a Changing Climate to the Department of Defense*. <https://www.documentcloud.org/documents/5689153-DoD-Final-Climate-Report.html>.