



ADVANCING EARTH  
AND SPACE SCIENCE

7 May 2018

The Honorable Richard Shelby  
S-128, The Capitol  
Washington, D.C. 20510

The Honorable Patrick Leahy  
S-146A, The Capitol  
Washington, D.C. 20510

The Honorable Rodney Frelinghuysen  
H-305, The Capitol  
Washington, D.C. 20515

The Honorable Nita Lowey  
1016 Longworth House Office Building  
Washington, D.C. 20515

Dear Chairman Shelby, Vice-Chairman Leahy, Chairman Frelinghuysen, and Ranking Member Lowey:

On behalf of the American Geophysical Union (AGU) and its 60,000 Earth and space scientist members, we thank you for all your hard work to complete the FY2018 appropriations process and provide strong funding for America's scientific enterprise under the more generous spending caps set by the budget agreement. While many of our nation's science programs received increases in the FY2018 omnibus, sustained and robust funding over the long-term is imperative to ensure that our nation's federal science agencies can continue their important work of advancing American innovation.

As you begin work on the FY2019 process, we urge you to continue supporting sustained growth and predictability for our nation's scientific enterprise, which has repeatedly proven to be a lucrative investment for America by stimulating jobs and the economy, safeguarding America's national security, and promoting public health and safety in our communities.

### **National Aeronautics and Space Administration**

We urge you to continue the strong pace of growth at the National Aeronautics and Space Administration (NASA) by appropriating \$21.7 billion for the agency in FY2019, a 5% increase above the amount provided by the FY2018 Omnibus. As part of that funding, we request that you appropriate at least \$6.5 billion for NASA's Science Mission Directorate and provide equitable increases in funding for all of NASA's science missions including Earth Science, Planetary Science, and Heliophysics. NASA has always been a multi-mission agency, with each mission complementing the others. Overall, science is a key backbone of NASA's work.

NASA's Earth Science Mission is critical for every sector of our economy, helping weather forecasters and other researchers to produce accurate weather forecasts and predict natural hazards, retailers to decide the timing and content of the merchandise they should stock, oil companies to



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decide where to drill, the military to enhance their geospatial knowledge of foreign territories, and farmers to know when and what to plant. We strongly appreciate Congress's commitment to continuing a series of robust Earth science missions, including CLARREO, PACE, OCO-3, and DSCOVR's Earth observing instruments. However, given the important applications of Earth science missions, we're concerned that the division received flat funding in the FY2018 Omnibus.

We urge the Committee to provide an increase in funding for NASA Earth Science in FY2019. As the Decadal Survey states, NASA Earth Science is “a key part of the nation’s information infrastructure.”<sup>1</sup> Increased funding for NASA Earth Science will allow NASA to begin implementation of the Earth System Explorer and Venture-Continuity missions recommended by the latest decadal. Further, our understanding of the universe and other planets is inextricably linked to the study of our own planet, whether it’s finding sites on Earth that are analogous to the terrain of other planets or understanding the common fundamentals of the evolution and composition of all planets. Providing sustained and robust funding for Earth Science will enable us to make progress towards the vision of space exploration.

We greatly appreciate Congress’s strong continued support of NASA’s Planetary Science Mission and 21% increase for the mission in the FY2018 Omnibus. We urge the Committee to continue investing in planetary science to pursue the priorities outlined in the Planetary Science Decadal Survey. Strong funding will allow ongoing support of important missions such as the Mars Rover 2020, as well as the Europa Clipper and Lander. Additionally, we urge the Committee to prioritize the Research and Analysis program, which allows NASA to pursue new planetary science missions alongside existing scientific endeavors and provides opportunities for the next generation of principal investigators.

We also appreciate the 1.5% increase for NASA’s Heliophysics Mission in the FY2018 Omnibus. We urge the Committee to continue providing robust funding for this research, which will greatly strengthen our ability to mitigate and prepare for the threat of space weather. The National Research Council estimates that a severe space weather event has the potential to inflict \$1-2 trillion dollars of economic and societal damage in the first year alone and impact more than 130 million people. To

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<sup>1</sup> National Academies of Science, Engineering, and Medicine, *Thriving on Our Changing Planet A Decadal Strategy for Earth Observation from Space* (2018) (online at [www.nap.edu/catalog/24938/thriving-on-our-changing-planet-a-decadal-strategy-for-earth](http://www.nap.edu/catalog/24938/thriving-on-our-changing-planet-a-decadal-strategy-for-earth))



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recover from such an event could take from 4-10 years.<sup>2</sup> Moreover, space weather fluctuations are not limited to rare catastrophic events but regularly impact our society and economy. It's estimated that the average economic impact of moderate geomagnetic events on the electric power grid in the U.S. is \$7 to \$10 billion per year.<sup>3</sup> Additionally, a moderate space weather event, if it were to disable the Global Navigation Satellite System (GNSS) for even one hour, would cost end-users, such as such as our energy and transportation sectors, \$4 to \$8 million in losses.<sup>4</sup> Strong and sustained funding for Heliophysics will help us be better prepared for space weather, especially through small and mid-size missions.

We also urge the Committee to continue to support NASA's Education office, including the Space Grant program. NASA provides unique STEM education opportunities and training that are vital to develop the next generation of NASA engineers, scientists, and innovators.

### **National Oceanic and Atmospheric Administration**

AGU requests that Congress appropriate \$6.2 billion for the National Oceanic and Atmospheric Administration (NOAA) in FY2019, a 6% increase over the FY2018 Omnibus. We were pleased to see a 3% increase in the FY2018 spending bill; however, for NOAA to continue to pursue and develop world-class research and products used across sectors, including academia and the private sector, NOAA needs annual growth of at least 4%. This level of funding also aligns with the Innovation Imperative recommendation<sup>5</sup> for our science agencies, to ensure that America is a competitive and innovative leader in science.

NOAA's wide array of products and services play a unique and irreplaceable role in serving the American people. Our coasts represent an enormous contribution to our economy: more than half of all Americans live along our coasts; over 2.8 million jobs are in ocean-dependent industries; and the

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<sup>2</sup> National Research Council (2008) Severe Space Weather Events: Understanding Societal and Economic Impacts: A Workshop Report. Washington, DC: The National Academies Press. <https://doi.org/10.17226/12507>.

<sup>3</sup> Schrijver, C. J. (2015), Socio-Economic Hazards and Impacts of Space Weather: The Important Range Between Mild and Extreme, *Space Weather*, 13, 524–528, doi:10.1002/2015SW001252.

<sup>4</sup> Abt Associates (2017), Social and Economic Impacts of Space Weather in the United States, Report for NOAA (online at [www.weather.gov/media/news/SpaceWeatherEconomicImpactsReportOct-2017.pdf](http://www.weather.gov/media/news/SpaceWeatherEconomicImpactsReportOct-2017.pdf))

<sup>5</sup> Innovation: An American Imperative (online at [www.amacad.org/content/innovationimperative](http://www.amacad.org/content/innovationimperative)).



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insured value of coastal property now exceeds \$10 trillion. NOAA plays a unique role in supporting these coastal economies by monitoring fisheries, restoring habitats, observing coastal conditions, and providing data to decision makers. In addition, as extreme weather events become more frequent and costly, there is increasing demand for weather services. Compared with the prior 35 years, the number of \$1B weather events between 2008 and 2015 have doubled. Jobs, properties, and communities all require NOAA data to prepare, respond, and mitigate against natural and manmade hazards. When planning for drought, flood, tornadoes, blizzards, hurricanes, and beyond, we have NOAA to thank for our continued improvement in accuracy, monitoring, and warning time when it matters most.

Our weather, climate, and ocean systems don't work independently of one another, and our understanding of these systems shouldn't either. From satellites and weather operations, to fisheries and coastal management, every facet of NOAA serves a purpose essential to the nation. Robust funding to protect and support all programs across the agency will help to safeguard the health and safety of millions of lives.

### **National Science Foundation**

We urge the Committee to provide \$8.45 billion in funding for the National Science Foundation (NSF) for FY2019, a 9% increase above the amount provided by the FY2018 Omnibus. We appreciate the Committee's strong investment in NSF in the FY2018 Omnibus, including funding for three regional class research vessels and a 5% increase in funding for the research and related activities account. This account, which encompasses the individual science directorates, is the largest funder of research and science education at our nation's colleges and universities. For example, NSF's Directorate for Geosciences (GEO) funds 59% of basic academic atmospheric, Earth, and oceans research. This funding is vital for retaining the next generation of scientists and innovators, as it provides the support and opportunities they need to pursue graduate degrees in STEM fields as well as early career grants.

Additionally, NSF Directorates support research infrastructure and centers that enable transformative science. We currently know less about our oceans than the lunar surface; GEO supports the International Ocean Discovery Program, helping scientists answer important science questions about our oceans and develop new tools and technology for ocean exploration. GEO also supports the U.S. Arctic and Antarctic Facilities and Logistics Program, which supports all U.S. research activities on Antarctica and through which the U.S. has maintained a 60-year uninterrupted Antarctic presence. Continued robust investment in NSF is critical if the U.S. hopes to maintain its global leadership in science across all fields.



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## **United States Geological Survey**

AGU requests \$1.2 billion for the United States Geological Survey (USGS) in FY2019, a 4% increase over FY2018. While AGU was pleased to see that USGS received a 6% funding increase in the FY2018 Omnibus, USGS has been historically strained by a large workload and too few resources. As the nation faces unprecedented resource challenges such as demand for limited energy supplies, vulnerability to natural hazards, and increased need for clean water, a substantial funding increase for USGS will allow the agency to maximize support for the nation's environmental, economic, and national security.

The USGS is uniquely positioned to provide information and inform responses to these challenges. With the distinct capacity to deploy interdisciplinary teams of experts to gather data, conduct research, and develop decision support tools, the USGS delivers timely assessments of mineral and energy resources, reduces risks from natural and human-induced hazards, and ensures accurate assessments of our water quality and quantity.

An investment of \$1.2 billion in FY2019 will allow the USGS to sustain current efforts in scientific discovery and innovation and to make strategic investments that will produce the vital energy, geologic, and environmental knowledge needed by decision-makers across the country.

## **Department of Energy**

We urge you to support strong funding for the Department of Energy's (DOE) research endeavors by providing \$6.6 billion for DOE's Office of Science, which is an increase of 4% over FY2018 Omnibus levels in inflation-adjusted dollars, and \$375 million for DOE's Advanced Research Project Agency - Energy (ARPA-E) program. Investments at this level will help to fortify America's leadership in energy research and development and support cutting-edge technology to transform our nation's energy landscape.

As the largest supporter of basic research in the physical sciences, DOE's Office of Science provides competitive grants that support more than 20,000 researchers at all career levels and provides these researchers – whose institutions range from academia to Fortune 500 companies – access to resources and user facilities to advance our knowledge and foster energy innovations. The Office of Science operates at the forefront of discovery, leading to more than 20 Nobel prizes in the last fifteen years alone. Continued and robust funding is crucial for the Office to continue this work.

We greatly appreciate Congress's continued support of the ARPA-E program, which received a 16% increase in the FY2018 Omnibus. Robust investments in ARPA-E promote our nation's security and



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stimulate jobs and the economy. ARPA-E bridges the gap between research and the commercial market, encouraging the development and deployment of transformative energy technology and providing researchers and small businesses the tools and resources for high-risk, high reward projects not traditionally funded by the private sector.

### **National Institute of Environmental Health Sciences**

AGU supports strong funding for the National Institute of Environmental Health Sciences (NIEHS) for FY2019. NIEHS is the leading supporter of critical research of environmental impacts on human health and the spread of disease. From monitoring where hurricanes have flooded toxic waste sites, to studying air pollution released from wildfires, to understanding how drought affects the incidence of cardiovascular disease, the public health of the nation depends on sound science to understand, respond to, and prevent future environmental challenges. Therefore, AGU requests that Congress support a healthier nation by robustly funding NIEHS in the FY2019 Appropriations bill.

We urge you to consider prioritizing science in FY2019 by providing robust funding at the levels we have requested for NASA, NOAA, NSF, USGS, DOE and NIEHS. AGU and its members stand ready to work with you as you craft the FY2019 Appropriations bills. We look forward to collaborating with you to advance America's scientific enterprise.

Sincerely,

A handwritten signature in black ink that reads 'Christine W McEntee'.

Christine McEntee  
CEO/ Executive Director  
American Geophysical Union

Cc:

Senate Committee on Appropriations, Subcommittee on Commerce, Justice, and Science  
Senate Committee on Appropriations, Subcommittee on Energy and Water  
Senate Committee on Appropriations, Subcommittee on Interior and Environment  
House Committee on Appropriations, Subcommittee on Commerce, Justice, and Science  
House Committee on Appropriations, Subcommittee on Energy and Water  
House Committee on Appropriations, Subcommittee on Interior and Environment  
The Honorable Mitch McConnell  
The Honorable John Cornyn  
The Honorable Charles Schumer



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The Honorable Richard Durbin  
The Honorable Paul Ryan  
The Honorable Kevin McCarthy  
The Honorable Nancy Pelosi  
The Honorable Steny Hoyer