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NASA'S MANAGEMENT OF GISS: THE GODDARD INSTITUTE FOR SPACE STUDIES

April 5, 2018

Report No. IG-18-015





Office of Inspector General

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RESULTS IN BRIEF

NASA's Management of GISS: The Goddard Institute for Space Studies

April 5, 2018

IG-18-015 (A-17-015-00)

WHY WE PERFORMED THIS REVIEW

Since its establishment in 1961, NASA's Goddard Institute for Space Studies (GISS or the Institute) has collaborated with the world science community to research the structure of the Earth, Moon, and other planetary bodies; the atmospheres of Earth and the other planets; the origin and evolution of the solar system; the properties of interplanetary plasma; Sun-Earth relations; and the structure and evolution of stars. Over the past 35 years, GISS has become well known for its development of global climate models that synthesize climate data to make long-range predictions related to Earth's atmosphere and climate. Located in a Columbia University office building in New York City, GISS primarily collaborates with Columbia but also works with other entities such as the Massachusetts Institute of Technology and the U.S. Department of Energy. In Fiscal Year 2016, NASA provided 96 percent of GISS' \$19.1 million annual funding.

GISS' prominent role in Earth science research – as a contributor to the Intergovernmental Panel on Climate Change's (IPCC) Nobel Prize winning report on climate change in 2007 – coupled with on-duty public outreach and education, as well as off-duty advocacy by individual GISS staff about climate change, has raised the group's public profile. At the same time climatologists debate the impact of man-made greenhouse gas emissions in predictive models, the issue has carried over into Government policy discussions and congressional hearings about the impact of human activity on global climate change.

During this audit, part of our broader examination of NASA's collaborations with universities and other non-governmental entities, we examined NASA's management of GISS. Specifically, we assessed the extent to which GISS (1) supports NASA's science goals and objectives, (2) complies with NASA's standards for the public release of scientific and technical information, (3) appropriately uses appropriated and non-appropriated funds in support of its mission, and (4) coordinates its research with NASA, other Federal agencies, and members of the scientific community. In meeting these objectives, we reviewed applicable Federal laws, regulations, and guidelines; evaluated Agency and Columbia University policies and agreements; interviewed officials from NASA, Columbia, and other agencies involved in climate research and modeling; analyzed GISS spending; and obtained relevant documentation.

WHAT WE FOUND

GISS is a major contributor in helping NASA meet its Earth science research goals, in particular the Agency's effort to improve the ability to predict climate change by better understanding the roles and interactions of the ocean, atmosphere, land, and ice in the climate system. In addition to climate modeling and maintenance of publically available climate-related datasets, the Institute's major efforts include research in atmospheric chemistry, astrobiology, aerosols, and water isotopes.

Apart from its substantial scientific contributions and contrary to NASA policy, we found that 43 of 66 (65 percent) new GISS scientific publications publicly released from October 2015 through September 2017 were not approved by GISS or Goddard officials prior to release. NASA policy requires numerous reviews and approvals before scientific information

can be publically released. These procedures – which include a technical review, export control review, a series of supervisory approvals and, if needed, a legal review – are designed to ensure the accuracy of scientific information released to the public and to prevent inadvertent release of sensitive information. Moreover, we found inadequate NASA guidance related to the independence and qualifications of the initial approver in the technical review process and other practices not in conformance with best practices.

We also found multiple instances of unallowable use of NASA-appropriated funds by GISS employees, grant recipients, and contractors for salary expenses, sub-contracting, and computer equipment. Based on our review of these unallowable expenses, improper charges under GISS' support contract, and the improper use of purchase cards, we question \$1.63 million of GISS' expenditures since 2012. In our judgment, this inappropriate use of NASA funds was largely the result of insufficient oversight by the principal investigators, NASA's technical officers, and approving officials coupled with the absence of a senior-level administrator at GISS to manage the Institute's grants and cooperative agreements.

Finally, GISS routinely collaborates with public and private institutions on an ad hoc basis to achieve NASA's strategic research goals. However, we found that the Institute is missing opportunities to partner with other Federal agencies and entities that conduct similar work because NASA lacks the long-term interagency agreements needed to set goals and objectives and provide needed funding. In our judgment, improved coordination may lead to efficiencies across agencies that do similar climate research and modeling.

WHAT WE RECOMMENDED

In order to ensure accurate scientific information is released to the public and to prevent sensitive information from inadvertent release, we recommended NASA's Chief Information Officer and the Chief of GISS ensure all NASA and GISS-generated publications complete a thorough and independent pre-publication review and approval process prior to release. To strengthen NASA's controls over the management of GISS funds, we recommended the Executive Director of the NASA Shared Services Center (NSSC) remedy the \$1.47 million in unallowable costs identified in NASA's GISS-related cooperative agreements with Columbia, and provide additional training for GISS managers, principal investigators, and technical officers regarding proper execution to cooperative agreements and grants. In addition, we recommended the Goddard Space Flight Center Director hire a senior administrator to serve as a Deputy Chief of GISS for Administration to manage the Institute's grants, cooperative agreements, personnel, and procurement actions. To recover funds spent on unallowable expenses, we recommended the Goddard contracting officer who handles the GISS Information Technology (IT) contract remedy the \$147,138 from Trinnovim, LLC for unallowable salaries and immigration fees. In order to increase accountability and control of GISS' use of Government purchase cards, we recommended the Goddard Director and Chief of GISS ensure all Institute equipment is entered into NASA's equipment accounting system, and counsel card holders and approving officials to follow Government purchase cards rules and in particular avoid split purchases. To improve GISS' partnership management and leverage collaboration, we recommended that the Associate Administrator for Science Mission Directorate and the Goddard Director, in coordination with the Associate Administrator of the Office of International and Interagency Relations, implement to the extent practicable the Government Accountability Office's best practices for establishing partnerships, including the formalization of agreements that outline the roles and responsibilities of each agency in the performance and application of climate research performed at GISS.

We provided a draft of this report to NASA management who concurred or partially concurred with our recommendations and described planned corrective actions. We consider the proposed actions responsive for all eight recommendations and will close them upon verification and completion of those actions. Columbia University also provided comments, which are included in this report.

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TABLE OF CONTENTS

Introduction.....	1
Background	2
GISS Research Helps NASA Achieve its Science Goals.....	9
GISS Modeling, Climate Datasets, and Research Support NASA’s Earth Science Goals	9
GISS: One of Six Major Domestic Climate Modeling Efforts	12
NASA Scientific Information Publically Released before an Independent Review and Approval.....	13
NASA Oversight of GISS Spending Needs Strengthened to Prevent Unallowable Expenditures	15
Questionable Expenses and Budgeting in NASA’s Cooperative Agreements with Columbia.....	15
Errors in GISS’ Main Support Contract.....	18
Poor Accountability for IT Equipment Purchased using the Government Charge Card	20
NASA Lacks Formal Structures to Enhance Collaboration in Climate Modeling	21
Conclusion	23
Recommendations, Management’s Response, and Our Evaluation	24
Appendix A: Scope and Methodology	26
Appendix B: GISS Resources and Expenditures	29
Appendix C: GISS Contracts, Cooperative Agreements, and Grants	31
Appendix D: Schedule of Questioned Costs/Dollar-Related Findings	33
Appendix E: Management’s Comments	34
Appendix F: Columbia University’s Comments	40
Appendix G: Report Distribution	44

Acronyms

CFR	Code of Federal Regulations
CMIP	Coupled Model Intercomparison Project
FAR	Federal Acquisition Regulation
FY	Fiscal Year
GAO	Government Accountability Office
GFDL	Geophysical Fluid Dynamics Laboratory
GISS	Goddard Institute for Space Studies
GMAO	Global Modeling and Assimilation Office
IPCC	Intergovernmental Panel on Climate Change
IT	Information Technology
MAP	Modeling, Analysis, and Prediction
MIT	Massachusetts Institute of Technology
NCAR	National Center for Atmospheric Research
NCEP	National Center for Environmental Prediction
NOAA	National Oceanic and Atmospheric Administration
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
NSSC	NASA Shared Services Center
OIG	Office of Inspector General
P-card	Purchase Card
PP&E	Property, Plant and Equipment
ROSES	Research Opportunities in Space and Earth Science
STI	Scientific and Technical Information
USGCRP	U.S. Global Change Research Program

INTRODUCTION

Since its establishment in 1961, NASA's Goddard Institute for Space Studies (GISS or the Institute) has collaborated with the world science community to research the structure of the Earth, Moon, and other planetary bodies; the atmospheres of Earth and the other planets; the origin and evolution of the solar system; the properties of interplanetary plasma; Sun-Earth relations; and the structure and evolution of stars. Over the past 35 years, GISS has become well known for its development of global climate models that synthesize climate data to make long-range predictions related to Earth's atmosphere and climate. The results of GISS modeling and research receive significant worldwide attention and are included in the National Climate Assessment, reports of the Intergovernmental Panel on Climate Change (IPCC), news articles, and research journals.¹

From the outset, NASA's intent was to co-locate GISS' small group of employees with researchers from Columbia University and other distinguished scientists to leverage their expertise and experience. Located in a Columbia University office building in New York City, GISS primarily collaborates with Columbia while also working with other entities such as the Massachusetts Institute of Technology (MIT) and the U.S. Department of Energy. GISS funding – comprised of NASA-provided funds, Columbia's support for researchers, and reimbursements for work performed by GISS employees for other agencies – totaled \$19.1 million in Fiscal Year (FY) 2016, with NASA providing about 96 percent of this total.²

GISS has been at the forefront of global climate modeling with its simulations of the Earth's climate that are widely circulated in the science community. GISS' prominent role in Earth science research – as a contributor to the IPCC's Nobel Prize winning report on climate change in 2007 – coupled with on-duty public outreach and education, as well as off-duty advocacy by individual GISS staff on climate change, has raised the group's public profile. At the same time climatologists debate the impact of man-made greenhouse gas emissions in predictive models, the issue has carried over into Government policy discussions and congressional hearings about the impact of human activity in global climate change.

During this audit, part of our broader examination of NASA's collaborations with universities and other non-governmental entities, we examined NASA's management of GISS. Specifically, we assessed the extent to which GISS (1) supports NASA's science goals and objectives, (2) complies with NASA's standards for the public release of scientific and technical information, (3) appropriately uses appropriated and non-appropriated funds in support of its mission, and (4) coordinates its research with NASA, other Federal agencies, and members of the scientific community. See Appendix A for details of our audit's scope and methodology.

¹ The National Climate Assessment – congressionally-mandated for publication every 4 years and coordinated by the U.S. Global Change Research Program – is an interagency study that provides an in-depth review of climate change impacts on the United States. The most recent report was issued in May 2014 and in late 2018 the fourth report is expected to be published. A special climate report that serves as Volume I of the 2018 report was published in November 2017. The IPCC, an international body that provides regular assessments on global climate change, was established in 1988 by the World Meteorological Organization and the United Nations Environment Program.

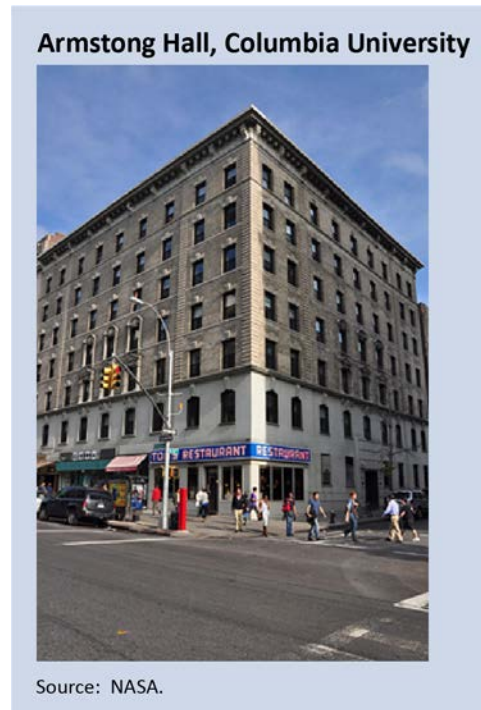
² This does not include approximately \$2 million for the ongoing renovation of GISS office space owned by Columbia University and leased through the General Services Administration.

Background

Goddard Space Flight Center (GSFC or Goddard) – NASA’s first and oldest space center – was established in May 1959. Much of its work focuses on studying the Earth, the sun, the solar system, and the universe. GISS, a laboratory in Goddard’s Earth Sciences Division, was organized in May 1961 to conduct basic research in space sciences.³ The Institute was established in New York City to capitalize on the academic expertise at leading universities in the area and to maximize non-NASA participation in theoretical research in the space sciences. Since the late 1960s, the Institute has operated from Armstrong Hall, a building owned by Columbia University and located in upper Manhattan’s Morningside Heights neighborhood, a few blocks south of the main University campus.⁴

GISS’ staff of 154 includes 29 NASA civil servant employees, 30 contractors, and 95 researchers from Columbia and other universities across the United States. As a major partner in GISS activities, 59 researchers and postdoctoral members from Columbia work at GISS, coordinating their efforts with Columbia’s Earth Institute, Department of Earth and Environmental Science, Department of Applied Physics and Applied Mathematics, and the Lamont-Doherty Earth Observatory.

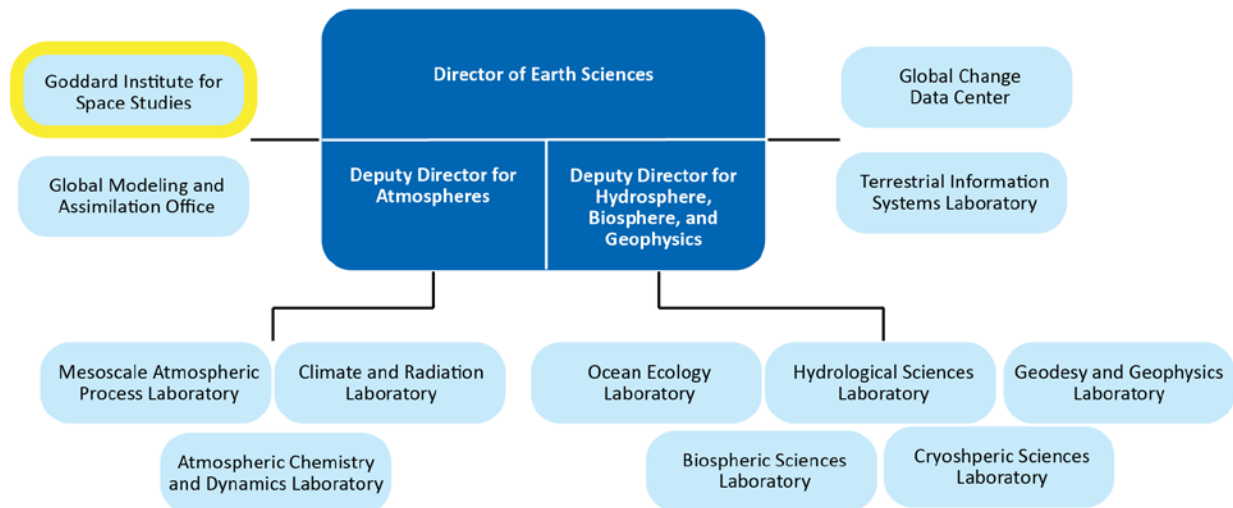
As the Institute’s parent organization, Goddard provides research direction and guidance, gives resource and procurement support, pays for the GISS building lease and security guards, and enables researchers to use its supercomputers to run GISS modeling. The Chief of GISS reports to the Director of Earth Sciences at Goddard (see Figure 1).



³ Formally known as the New York City office of GSFC Theoretical Division, over the years GISS was also referred to as the Goddard Institute for Space Studies in some publications or simply the Institute for Space Studies in others.

⁴ The restaurant on the first floor of the building appeared in numerous episodes of the TV series *Seinfeld*.

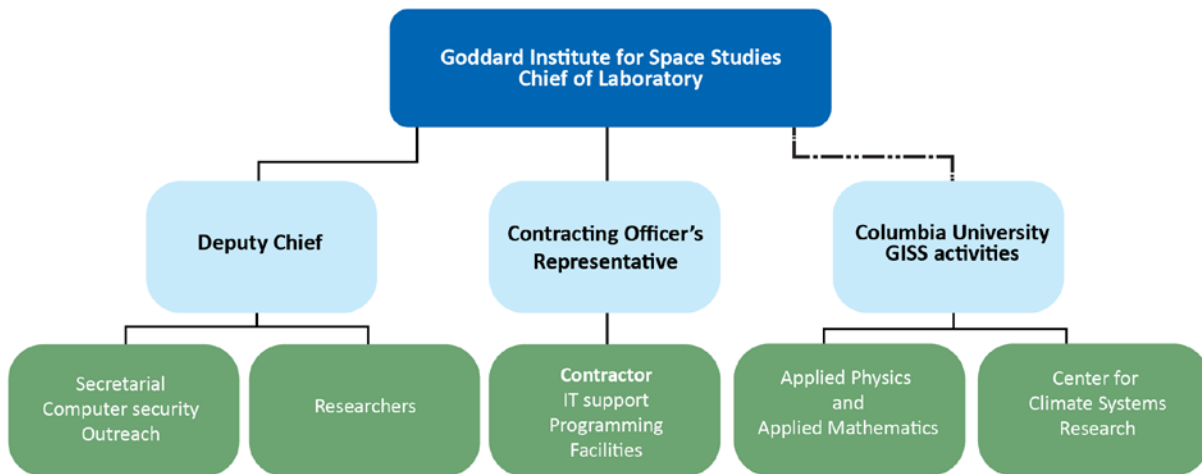
Figure 1: Goddard Earth Sciences Division



Source: NASA.

GISS is organized with a Chief of Laboratory, a Deputy Chief who supervises research efforts, and a contracting officer's representative who oversees GISS' main support contractor (see Figure 2). Many of the Columbia researchers who work with GISS are also located at the GISS facility.

Figure 2: GISS Organizational Chart



Source: GISS.

The following are examples of major research and modeling projects undertaken by GISS researchers:

- *Global Climate Modeling*. Conducts simulations of Earth's climate system to test climate sensitivity of various factors including man-made greenhouse gases. The results of these simulations help form the predictive analysis found in IPCC and national climate assessments.
- *Astrobiology and the search for life on other planets*. Examines the habitability of other planets. For example, in August 2016 GISS published a paper stating that Venus may have had a shallow liquid-water ocean and habitable surface temperatures for up to 2 billion years of its early history.
- *Climate Impacts Group*. Seeks to improve understanding of how climate affects human society. For example, after Hurricane Sandy GISS' projections were used by New York City officials in developing guidelines for renovations and rebuilding in the event of coastal flooding due to rising global sea levels.
- *Goddard Institute Surface Temperature Analysis*. Analysis of global climate change using surface air temperature changes over time.
- *Aerosol Research*. An examination of minute particles in the atmosphere using instruments mounted on an airborne platform.

To codify its working relationship, Goddard and Columbia University signed a non-reimbursable Space Act Agreement in 2015 to clarify both parties' rights and responsibilities.⁵ Prior to this time, the two groups had only signed a series of 3-year cooperative agreements related to specific projects. In addition to reinforcing the importance of collaboration between Columbia and NASA in climate research, the overarching agreement created a Steering Committee to guide research efforts. The Agreement also directed the parties to identify a new location for GISS offices at Columbia University's "Manhattanville" campus – an ongoing development of several new buildings north of the school's main campus in Manhattan. However, according to both GISS and Columbia officials, any potential move to a new facility is likely to be many years in the future. In the meantime, the current GISS facility is undergoing a \$2 million renovation with an agreed-upon 10-year lease once work is completed. Moreover, Columbia's current plans for its Manhattanville campus do not include space for GISS.

Earth Science Research across the Federal Government

Currently, 13 Federal entities conduct climate research: NASA; the Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Interior, State, and Transportation; the Environmental Protection Agency; the National Science Foundation; the Smithsonian Institution; and the U.S. Agency for International Development. NASA's Earth Science portfolio includes 69 satellite and instrument missions as of September 2016 that, among other things, monitor changes in ocean and carbon dioxide levels. NASA's Earth observation data is routinely used by policymakers, researchers, and other Government agencies and in FY 2017 contributed to 11,673 unique data sets.

⁵ Space Act Agreements are a form of "Other Transaction Authority" provided to NASA in the National Aeronautics and Space Administration Act of 1958. These agreements establish legally enforceable commitments between NASA and a partner to accomplish a stated objective without imposing the extensive list of requirements routinely found in most Government contracts.

GISS is one of six major organizations modeling changes in the Earth's climate using components of both the atmosphere and ocean. The other five are NASA's Global Modeling and Assimilation Office (GMAO), the National Oceanic and Atmospheric Administration's (NOAA) Geophysical Fluid Dynamics Laboratory (GFDL) and National Center for Environmental Prediction (NCEP), the National Center for Atmospheric Research (NCAR), and the Department of Energy. As shown in Figure 1, GMAO is also organized under the Goddard Earth Sciences Division and uses computer modeling to conduct weather analysis that includes seasonal and decadal predictions.

GISS Research Efforts and Modeling

A key objective of GISS research is understanding and predicting global atmospheric and climate changes – research that aligns with the second prong in NASA's Strategic Plan to “advance understanding of Earth and develop technologies to improve the quality of life on our home planet.”⁶ To that end, GISS uses data collected from multiple sources – particularly from NASA's Earth science satellites, airborne platforms and on-site monitoring – to develop atmospheric, oceanic and cryospheric models using computer programs to analyze climate, and project future climate changes.

The bulk of current GISS modeling efforts use a computer simulation program called the ModelE Series which was developed in-house and simulates the Earth's atmosphere, ocean, sea ice, and land surface.⁷ In 1978, GISS ran its Global Circulation Models on an in-house IBM-360/95 computer – at that time, one of the fastest computers in the world. Today, GISS still uses some of the fastest computers in the world – NASA supercomputers at Goddard and Ames Research Center that GISS accesses via dedicated lines and the Internet.

GISS Publications and the Release of Science and Technical Information

GISS is a prolific producer of scientific research, publishing more than 4,400 papers authored or co-authored by GISS scientists and colleagues since its creation in 1961.⁸ These publications are considered NASA Scientific and Technical Information (STI), defined as a paper, abstract, journal article, or presentation that delivers the results (analyses of data, facts, and resulting conclusions) of basic and applied scientific, technical, and related engineering research and development. Publishers of STI are required to ensure information released to the public is reviewed for technical accuracy and sensitivity. Technical accuracy reviews can be accomplished by a board of experts or a single internal technical advisor. An additional peer review is routinely performed by a publisher prior to a paper's publication in a major science journal.

⁶ NASA Strategic Plan 2014.

⁷ The source code for the ModelE program is available on the Internet free of charge.

⁸ GISS documents can be accessed at: <https://pubs.giss.nasa.gov/>.

GISS Sources and Types of Funding

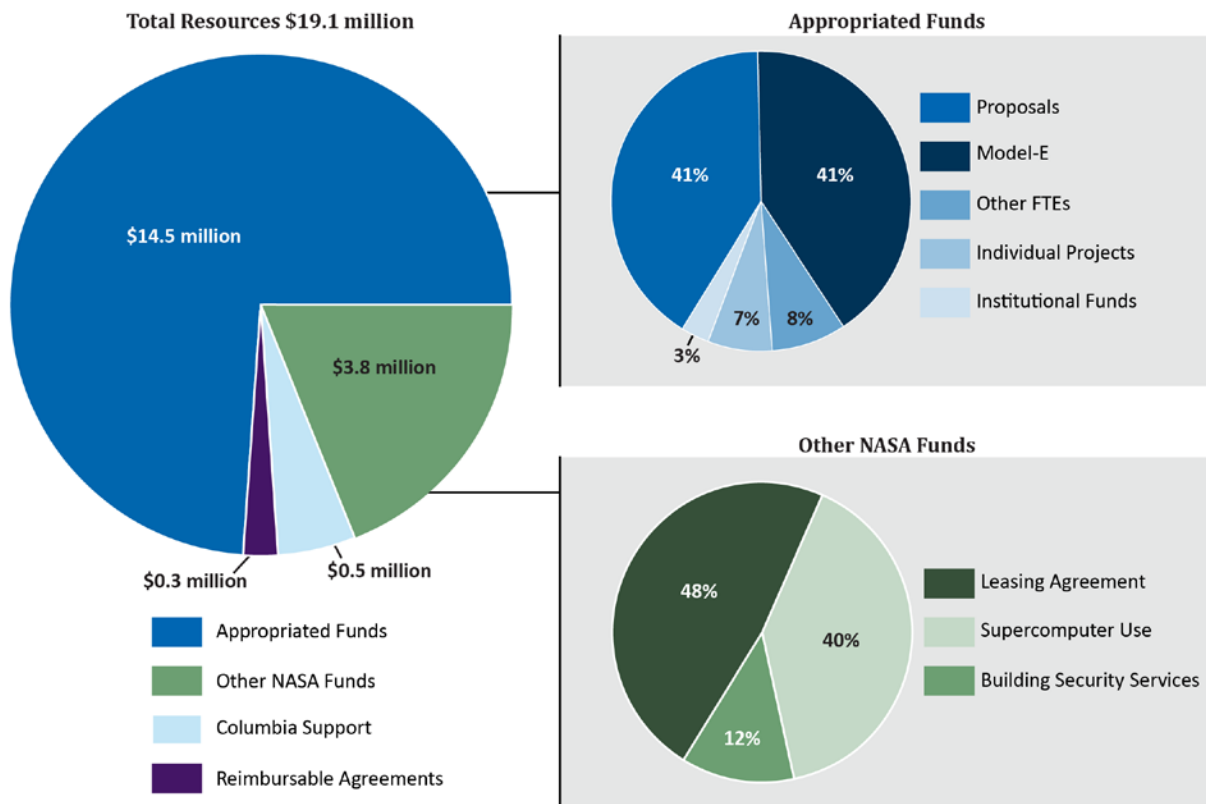
GISS' total available funding in FY 2016 was approximately \$19.1 million, of which \$18.3 million (96 percent) comes from NASA:

1. *Appropriated NASA funding.* GISS receives approximately \$14.5 million annually to perform modeling and research, support grants and cooperative agreements, and pay their main support contractor, Trinnovim, LLC, which provides specialized Information Technology (IT) and administrative support services. In November 2017, SciSpace, LLC replaced Trinnovim as the main support contractor.
2. *Funding from Goddard.* In addition to GISS' appropriated budget, Goddard pays approximately \$1.8 million a year to the General Services Administration to lease office space in a building owned by Columbia; \$440,000 for building security; and approximately \$1.5 million a year for the Institute's access to Agency supercomputers.⁹
3. *Columbia University support.* Over the last 4 years, Columbia University provided between \$311,000 and \$507,000 a year to pay salaries of University researchers co-located with the GISS researchers.
4. *Funding from reimbursable agreements.* GISS receives a small amount of funding from reimbursable agreements with the Department of Energy and teaching arrangements with Columbia University. This funding has ranged from approximately \$200,000 in FY 2014 to over \$530,000 in FY 2017.

Figure 3 illustrates the funding resources available to GISS in FY 2016. See Appendix B for details on the Institute's funding resources and annual expenses.

⁹ The General Services Administration's lease and building security contract is funded by the Goddard Center Management and Operations budget, whereas the supercomputer charges are funded by the Goddard Earth Sciences Division.

Figure 3: Funding Available to GISS in FY 2016



Source: Office of Inspector General (OIG) Analysis of NASA data.

Funding from Competitive Awards for Research in Space and Earth Science

About 40 percent of the Institute's appropriated funding (approximately \$6 million in 2016) comes through GISS researchers' successful efforts in securing NASA research funds. For example, each year NASA's Science Mission Directorate releases a request for research proposals under a program known as Research Opportunities in Space and Earth Science (ROSES). GISS researchers compete for these awards alongside researchers from other NASA centers, universities, nonprofits, Government laboratories, and for-profit corporations across the country. GISS currently is managing a \$6.45 million, 5-year study under the ROSES Program to examine the habitability of other planets in the solar system.

GISS Expenses

GISS' funding is used to pay for various types of expenses, to include: (1) cooperative agreements and grants with universities, institutes, and non-profits, (2) contracts for IT support and building security, and (3) small purchases with the Government purchase cards (P-cards). See Appendix B for details on the Institute's annual expenses.

Cooperative Agreements and Grants

Cooperative agreements and grants are considered a type of financial assistance because they support or stimulate a public purpose. A cooperative agreement includes substantial involvement or collaboration between NASA and the awardee, whereas a grant denotes minimal NASA involvement. Between FY 2014 and FY 2017, GISS provided approximately \$27 million to universities, institutes, and governments to fund research through 10 cooperative agreements and 15 grants. The main collaboration for cooperative agreements is with Columbia University, which comprises 87 percent of GISS' total awards during this 4-year period. As of April 2018, GISS had four active cooperative agreements: two with Columbia, one with MIT, and one with Duke University. All four of these agreements address research into climate change. Tables 4 and 5 in Appendix C list the Institute's cooperative agreements and grants active since FY 2014.

GISS also has two reimbursable agreements with the Department of Energy in which they support the agency's Atmospheric Radiation Measurement Program and Atmospheric System Research Program. One agreement focuses on the study of temperature differences in the atmosphere and climate patterns while the other studies cloud differences to understand and predict ice formations to improve the climate model simulation.

Contracts

GISS uses Federal Acquisition Regulation (FAR)-based contracts to obtain specialized scientific IT and administrative support services, IT system integration, and security. GISS' three primary contractors are SciSpace, LLC; ADNET Systems Inc.; and Alutiiq Pacific, LLC. In November 2017, SciSpace replaced Trinnovim, LLC as the main support contractor and was awarded a \$16.7 million, 5-year contract.

Trinnovim, LLC recently completed a 5-year, \$17 million cost-plus-fixed-fee contract to provide IT support services including scientific and systems programming and analysis, data handling and processing, computer operations, library and publication services (including manuscript preparation, illustration and duplication), and reproduction services. ADNET, managed by Goddard under a much larger contract, provides GISS with IT systems integration while GISS' on-site security guards are provided through a contract with Alutiiq. Costs associated with each contract are listed in Appendix C, Table 3.

Administration and Management of GISS Procurement Mechanisms

As previously described, GISS utilizes a variety of procurement mechanisms to include cooperative agreements, grants, contracts, and P-cards. The NASA Shared Services Center (NSSC) at Stennis Space Center is responsible for administration and management of the cooperative agreements and grants. GISS P-cards were managed by Goddard officials until October 2017 when this responsibility transitioned to the NSSC.

Day-to-day administration of grants and cooperative agreements are overseen by a principal investigator from the entity receiving the grant and the technical officer from the NASA organization providing the grant.

In addition, GISS has the ability to make small purchases (under \$3,500) through the Federal Government's commercial P-card program. From October 2014 through June 2017, five cardholders from the Institute used their P-card to procure IT products, subway cards for use on the New York transit system, and lab equipment. During the course of our audit, the number of cardholders was reduced to two due to a NASA initiative to reduce the overall fees charged by the servicing bank for each P-card.

GISS RESEARCH HELPS NASA ACHIEVE ITS SCIENCE GOALS

GISS is a major contributor to meeting NASA's Earth science research goals, in particular the Agency's effort to improve the ability to predict climate change by better understanding the roles and interactions of the ocean, atmosphere, land, and ice in the climate system. In addition to climate modeling and maintenance of publically available climate-related datasets, the Institute's major efforts include research in atmospheric chemistry, astrobiology, aerosols, and water isotopes.

GISS Modeling, Climate Datasets, and Research Support NASA's Earth Science Goals

GISS research contributes to NASA's strategic goal to "advance understanding of Earth and develop technologies to improve the quality of life on our home planet."¹⁰ The Institute also contributes to all seven of NASA's Earth Science Strategy goals articulated in the Agency's 2014 Science Plan, including efforts to better predict climate changes by understanding the roles and interactions of the ocean, atmosphere, land, and ice.¹¹ Moreover, GISS contributes to NASA's Modeling, Analysis, and Prediction (MAP) objectives, which include discovering how the Earth responds to natural and human-induced changes and what consequences such changes may hold for human civilization.¹²

GISS' highest-profile contribution to the study of Earth Science is its atmosphere-ocean global climate model known as ModelE. GISS was one of the first research organizations in the world to create models that scientifically analyze and predict climate change. Notably, GISS scientists contributed to reports produced by the IPCC for which it was awarded the 2007 Nobel Peace Prize.

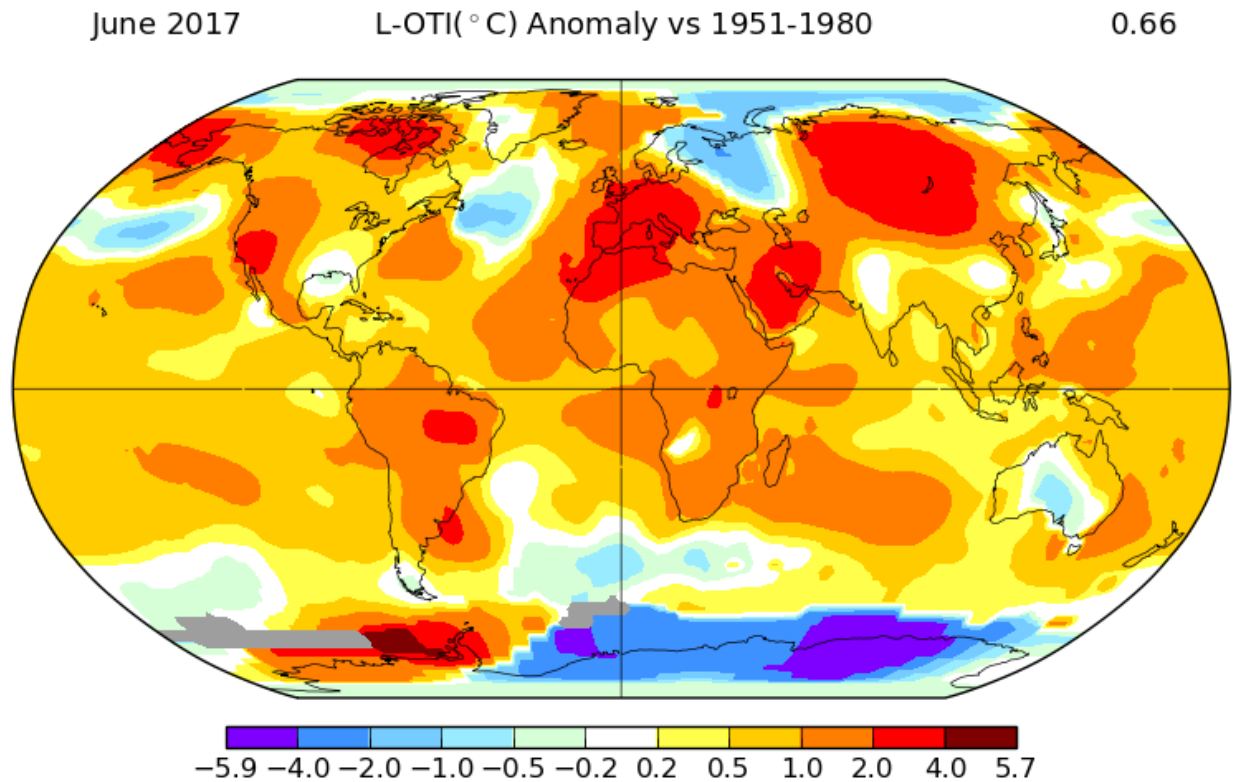
In addition to its modeling, GISS analyzes and maintains publically available datasets that track the Earth's temperature, aerosols, clouds, precipitation, oceans, and storms. An example is the GISS Surface Temperature Analysis the Institute produces monthly and posts on its website, as shown in Figure 4. Using temperatures recorded for June 2017, this figure shows the deviation in average temperatures from the period of 1951 through 1980 with yellow and red showing an increase, and blue and purple showing a decrease.

¹⁰ NASA Strategic Plan 2014.

¹¹ NASA, "2014 Science Plan," 2014 available at https://smd-prod.s3.amazonaws.com/science-pink/s3fs-public/atoms/files/2014_Science_Plan_PDF_Update_508_TAGGED_1.pdf.

¹² NASA, "MAP Program," last updated October 5, 2017 available at <https://map.nasa.gov/>.

Figure 4: Temperature Deviation from Average Temperature for the Period 1951-1980

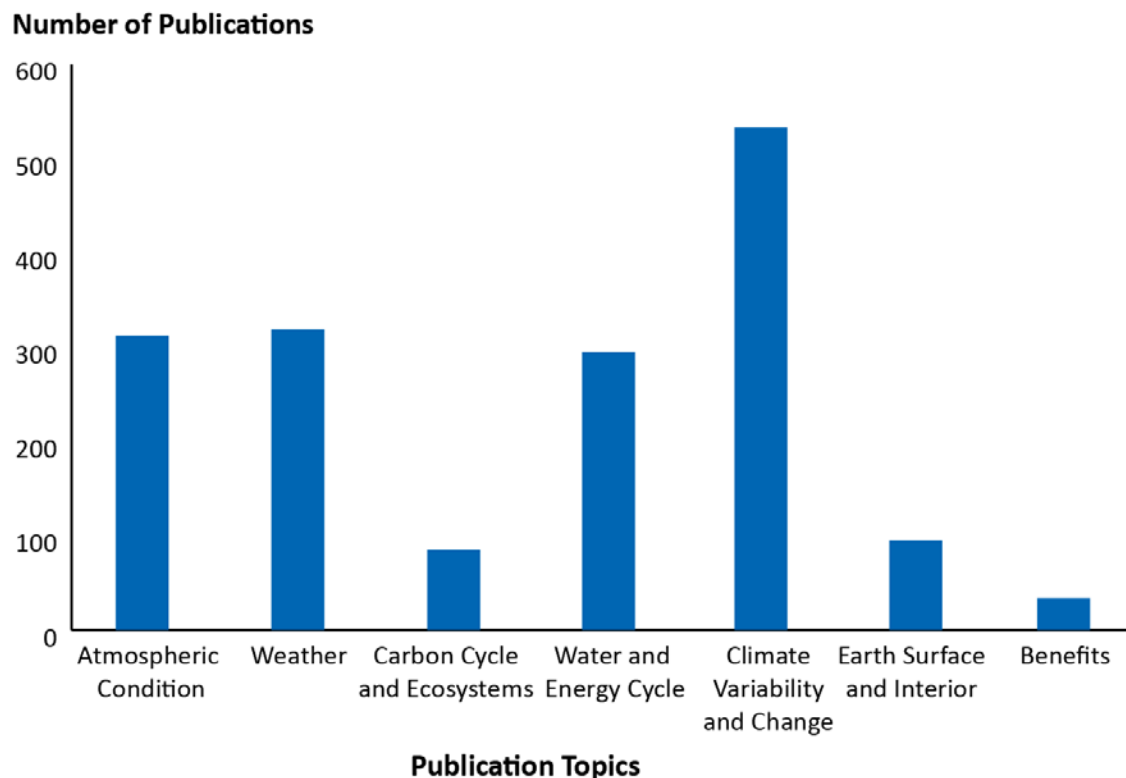


Source: NASA GISS.

In addition, GISS staff play a key role by publishing research papers on a variety of topics related to NASA's Earth Science goals, with a significant focus on the examination of climate change.¹³ Of the Institute's 1,694 publications issued between 2007 and 2017, virtually all were related to NASA's Earth Science focus areas, as shown in Figure 5.

¹³ As noted earlier, a significant amount of GISS' appropriated funding – 40 percent – comes from the competitive research awards such as the ROSES Program in which GISS researchers compete for awards with other NASA and private researchers.

Figure 5: Publications Examining NASA's Earth Science Focus Areas (2007-2017)



Source: OIG analysis of NASA data.

Notably, GISS contributed modeling results, report authors, and peer reviewers to both the 2013 IPCC report on climate change and the 2014 U.S. National Climate Assessment.¹⁴ More recently, four GISS staff members contributed to the U.S. Global Change Research Program Climate Science Special Report released in November 2017. GISS modeling also contributed to the National Research Council's 2007 Earth Science Decadal Survey goal of understanding the planet, how it supports life, and how human activities will affect its ability to do so in the future.¹⁵ GISS' work addresses the Decadal Survey's recommendation that NASA increase its support for Earth system modeling, including providing high-performance computing facilities and support for scientists working in the areas of modeling and data assimilation.

¹⁴ This National Climate Assessment, produced by the U.S. Global Change Research Program (USGCRP), is intended to report on the state of science relating to climate change and its physical impacts. The USGCRP is composed of 13 Federal departments and agencies that carry out research and support the Nation's response to global change. The USGCRP is overseen by the Subcommittee on Global Change Research of the National Science and Technology Council's Committee on Environment, Natural Resources, and Sustainability, which in turn is overseen by the White House Office of Science and Technology Policy. The agencies within USGCRP are the Departments of Agriculture, Commerce (NOAA), Defense, Energy, Health and Human Services, Interior, State, and Transportation; the Environmental Protection Agency, NASA, the National Science Foundation, the Smithsonian Institution, and the U.S. Agency for International Development.

¹⁵ The 2017 Earth Science Decadal Survey was published in January 2018.

GISS: One of Six Major Domestic Climate Modeling Efforts

The United States has six major climate modeling organizations and 13 Federal agencies that participate in climate research. While many of the climate models complement each other, each agency has a particular research focus. For example, while the Department of Energy's modeling is designed to support the Nation's energy planning and the National Center for Environmental Prediction on short-term weather and seasonal forecasts, both use modeling that joins atmospheric and oceanic datasets. For its part, GISS provides long-term climate change assessments that interpret NASA remote sensing products with a focus on the importance of interactive atmospheric composition in response to solar variability and air pollution. Table 1 describes the Nation's major climate modeling efforts.

Table 1: U.S. Modeling Efforts and Focus

Modeling Group	Model	Model Focus
Department of Energy	ACME V1	Supports the Department of Energy's energy planning and computational resource needs
NOAA GFDL	CM3	Long-term climate change research advancing NOAA's mission goal to understand and predict changes in climate
NASA GISS	GISS-E2/2.1	Long-term climate change research which integrates both historical data and NASA satellite data
NASA GMAO	GEOS5	Data assimilation products for short-term weather, longer seasonal forecasts, and re-analyses
NCAR	CESM1	Long-term climate change research
NCEP	CFS V1 & V2	Operational data assimilation products for short-term weather, longer seasonal forecasts, and re-analyses

Source: Schmidt, G.A., D. Bader, L.J. Donner, G.S. Elsaesser, J.-C. Golaz, C. Hannay, A. Molod, R. Neale, and S. Saha, 2017: Practice and philosophy of climate model tuning across six U.S. modeling centers. *Geosci. Model Dev.*, 10, 3207-3223, <https://doi.org/10.5194/gmd-10-3207-2017>.

Within NASA, Goddard's GMAO also uses computer models and data assimilation techniques but while GISS climate modeling looks across centuries and millennia, GMAO focuses on seasonal and decadal weather. In support of the IPCC's Fifth Assessment report published in 2014, NASA provided simulations that included long- and short-term projections with the long-term projections from GISS and the short-term projections from GMAO. The unique capabilities of NASA's two modeling organizations were acknowledged by NASA's Technical Capabilities Assessment Team in its examination of potential duplication within the Earth Sciences Division. As a result, given their differing focus, NASA does not intend to consolidate their modeling efforts.

While GISS and GMAO modeling generally use different time scales, they are not completely distinct. GISS and GMAO – like many international climate modeling centers – use an international protocol called Coupled Model Intercomparison Project (CMIP), which provides a framework for coordinating climate change model testing. Although different organizations may use different parameters, all models using CMIP are expected to project climate to both the years 2035 and 2100. Indeed, the six modeling organizations described above have all participated in the CMIP modeling efforts.

NASA SCIENTIFIC INFORMATION PUBLICALLY RELEASED BEFORE AN INDEPENDENT REVIEW AND APPROVAL

We found that contrary to NASA policy, 43 of 66 (65 percent) new GISS scientific publications publicly released from October 2015 through September 2017 were not approved by GISS or Goddard officials prior to release.¹⁶ NASA policy requires a technical review, export control review, and a series of supervisory approvals and if needed a legal review for possible copyright or third-party information prior to release of scientific information. NASA's review procedures are designed to ensure the accuracy of scientific information released to the public and to prevent inadvertent release of sensitive information.

In addition to reviewing the approval process for release of GISS scientific information, we also analyzed the seven papers written by GISS leadership during this same period and found five instances where subordinates served as initial approvers for their supervisors' work. This practice is not prohibited by NASA policy, but is contrary to standard scholarly practice.¹⁷ A subordinate may have an inherent conflict of interest reviewing their supervisor's draft publication, since failure to approve their superior's work could delay or prevent publication, negatively impacting their supervisor's scientific career. Moreover, the initial approver is a key person in the review process and is required by NASA policy to attest that the scientific information is accurate and of sufficient merit to warrant publication. Initial approvers may conduct a technical review themselves or, in some cases, rely on a peer or board's review.¹⁸

Overall, we found NASA guidance related to the independence and qualifications of the initial approver in the technical review process inadequate and not in conformance with best practices.¹⁹ Specifically, while authors are prohibited by NASA guidance from approving their own work, subordinates are permitted to approve their superiors' work and a technical reviewer can work within the same research team as the author. Other organizations that do similar quality control have stricter review requirements. For example, to ensure impartiality the Department of Energy's Office of Science and

¹⁶ The 66 publications represented all of the first-time publications issued in FY 2016-2017. We did not include reprints or revised editions of scientific work since these may have had a previous review. NASA policy states – "To preclude inappropriate dissemination, STI [Scientific and Technical Information] will be reviewed through the elements of the NASA Scientific and Technical Information Document Availability Authorization, NASA Form 1676, as detailed in NASA Procedural Requirements (NPR) 2200.2 prior to being published, released external to the Agency, or made available to foreign persons by, or at the direction of, NASA. This review requirement includes STI derived from NASA-funded contracts, grants, and cooperative agreements when published or released by, or at the direction of, NASA." NASA Policy Directive (NPD) 2200.1C § 1.c, "Management of NASA Scientific and Technical Information," December 9, 2014.

¹⁷ The judgmental sample is STI authored by the GISS Chief and in one case by the GISS Deputy Chief.

¹⁸ NPD 2200.1C requires responsible officials to ensure appropriate minimum review of NASA STI Report Series documents.

¹⁹ In 2016, the Association of American University Presses published Best Practices in Peer Review (located at <http://www.aaupnet.org/resources/for-members/handbooks-and-toolkits/peer-review-best-practices>).

Technology requires independent peer reviewers, namely researchers not involved as a participant, supervisor, technical reviewer, or advisor in the work under review.

Despite our findings, an annual internal NASA audit of Goddard-related scientific information showed all selected GISS papers and presentations to be in full compliance with review procedures in 2016. However, we examined the criteria used in this review and found that the approval date (that is, whether approval was granted before or after the information was published) and the process for selecting technical reviewers were not considered. NASA officials conducting the audit told us that as long as the GISS publication received directorate-level approval – regardless of the date – they deemed the publication “passed.” However, as discussed previously, NASA policy requires pre-publication review of scientific information. Consequently, we question the value of such an internal audit in assessing GISS’ compliance with Agency publication policy.

In our judgment, an effective review process is a key internal control to prevent researcher bias and ensure that STI is accurate and of sufficient merit to warrant publication or release. Given NASA’s central role in collecting and analyzing data related to climate change, independent review of its scientific information is critical to prevent release of erroneous information that could affect NASA’s credibility and, in turn, the scientific and political debate surrounding global climate change.

NASA OVERSIGHT OF GISS SPENDING NEEDS STRENGTHENED TO PREVENT UNALLOWABLE EXPENDITURES

We found multiple instances of unallowable use of NASA funds by GISS employees, grant recipients, and contractors for salary expenses, sub-contracting, and computer equipment. Based on our review of these unallowable expenses, improper charges under GISS' support contract, and the improper use of P-cards, we question \$1.63 million of GISS' expenditures since 2012.²⁰ In our judgment, this inappropriate use of NASA funds was largely the result of insufficient oversight by the principal investigators and NASA's technical officers and approving officials, coupled with the absence of a senior-level administrator at GISS to manage the Institute's grants and cooperative agreements.

Questionable Expenses and Budgeting in NASA's Cooperative Agreements with Columbia

As a result of our interviews with NASA and Columbia officials and a detailed review of expenses in Columbia's cooperative agreements and other financial documents, we identified approximately \$1.47 million in questionable expenses from 2012 to 2017 or approximately 4 percent of the total value of the cooperative agreements we examined. These findings included:

- *Unallowable expenses.* Columbia spent \$1,219,491.41 on contract services, financial aid, and salaries for graduate students and short-term employees – all items not included in the cooperative agreement.²¹ Although use of these funds supported GISS objectives, the expenses were either outside the scope of the agreement or were not approved by the NASA grant officer before expenditure. Included in this total is \$633,073 for graduate tuition and fees that were not part of the cooperative agreement proposal and not approved by the NASA grant officer. Columbia and GISS officials had approved the budget change and, when questioned by OIG auditors, said under NASA criteria only significant changes in scope required notification to the grant officer. In our judgment, diverting over half a million dollars – 9 percent of the agreement's value – from research to pay for graduate student education should have been deemed "significant" and therefore routed to the NASA grant officer for approval.

²⁰ See Appendix D for a summary of questioned costs.

²¹ The Code of Federal Regulations (CFR) (Title 2 – Grants and Agreements, Part 220) describes four conditions for costs to be allowable for University grants and cooperative agreements: (1) the costs must be reasonable; (2) they must be allocable to sponsored agreements under the principles and methods provided in the section; (3) they must be given consistent treatment through application of generally accepted accounting principles and appropriate to the circumstances; and (4) they must conform to any limitations or exclusions set forth in the Code's principles or in the sponsored agreement as to types or amounts of cost items. 2 CFR § 200.308 also identifies the post-award changes in the agreement that require prior approval by NASA grant officers such as changes in scope, key personnel, and contracts. For changes in scope, the CFR (Title 14 – NASA) uses the term "significant" to describe reportable changes, but this description is not found in the Title 2 Regulations that provides the governing guidance for the Federal Government.

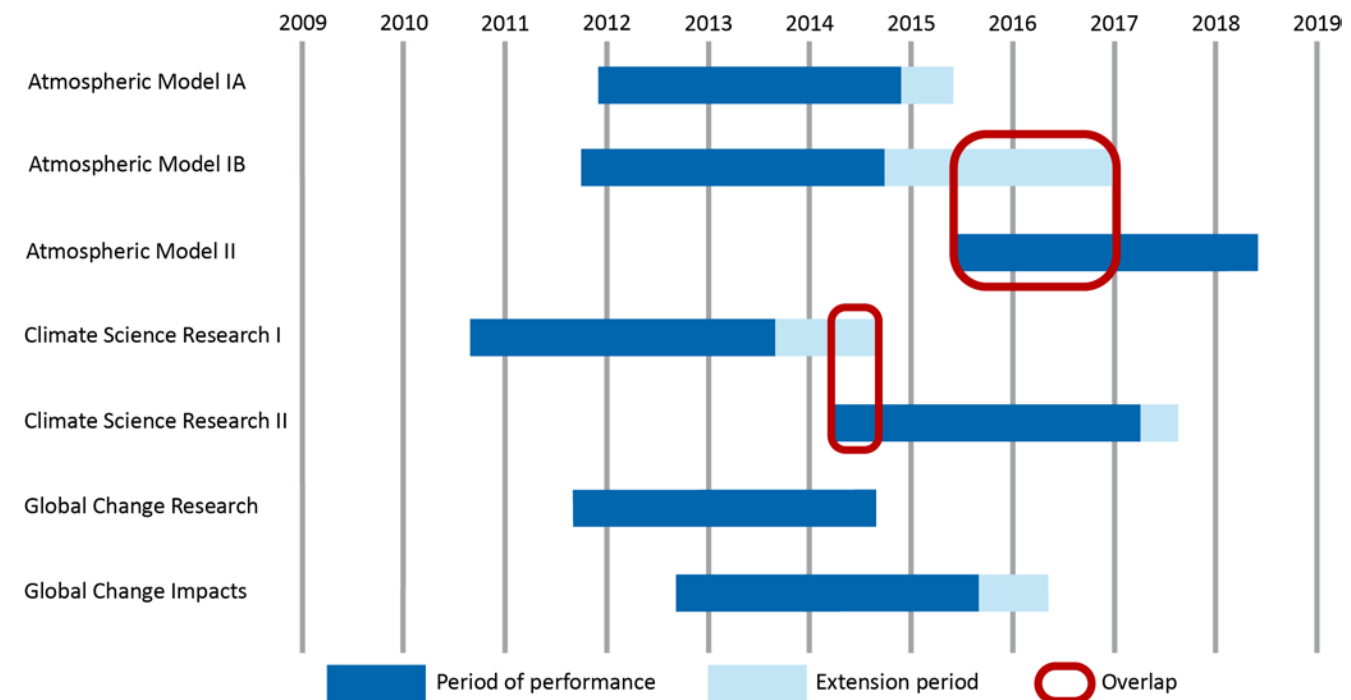
- *Unreasonable expenses.* In an agreement on modeling and atmospheric circulation and cloud processes, Columbia spent \$62,482 on salaries and other expenses to pay for work conducted more than a year after the final project report was submitted. The final report was evaluated and approved by NASA in July 2015; however, in September 2016 NSSC approved an extension for the period of performance instead of de-obligating the remaining funds or transferring those funds to a follow-on agreement. To avoid a double payment for the same work, NSSC had planned to remove this portion of work from the follow-on agreement and reduce the award amount by \$62,482; however, this never occurred. After bringing this issue to the attention of NSSC officials, they agreed to complete the action to de-scope the follow-on agreement.
- *Improper financial transactions.* A Columbia administrative employee working at GISS hired his spouse as a short-term Columbia employee who was improperly paid using cooperative agreement funds. In addition, the Columbia employee bought computer equipment totaling \$18,668 that later could not be immediately accounted for due to the lack of central inventory. Columbia discovered the improprieties in a 2015 internal University audit, fired the employee, and made restitution to NASA of \$72,939 in unallowable salary charges; however, it made no restitution for the computer purchases.²² During the course of our audit, Columbia University located two computers and confirmed the equipment is being used to support the cooperative agreements. In addition, the school agreed to repay NASA for the remaining unaccounted-for equipment.
- *Improper labor expenses.* We found that a Columbia financial analyst had performed duties similar to a NASA resource analyst – a function routinely performed by a NASA civil servant or NASA contractor given the sensitivity of tracking government funds and costs – resulting in \$168,013 in unallowable charges to NASA.²³ Although we determined this employee provided needed support for GISS activities, we do not find this to be an allocable cost in accordance with 2 Code of Federal Regulations (CFR) Part 220 because the work was not done to support this agreement. In 2015, NASA competed a Federal resource analyst position for which this Columbia employee applied, was judged the most qualified, and subsequently hired.

In addition to these questionable expenses, we also found that NASA's practice of granting extensions in its cooperative agreements with GISS created an unnecessary overlap with other cooperative agreements containing similar work requirements. Specifically, although two cooperative agreements related to atmospheric modeling were merged into one agreement in 2015, one agreement's period of performance (Atmospheric Model 1B) overlapped with the new 2015 agreement by 18 months. In addition, we found that the two cooperative agreements related to climate science overlapped by approximately five months. Instead of agreeing to extensions, in our judgment NASA should have de-obligated the funds remaining on the agreements. According to the Chief of GISS, the difficulty in managing numerous agreements led to his initiative to consolidate and reduce the number of agreements with Columbia from five to two. Nonetheless, these extensions and resulting overlaps resulted in NASA paying approximately \$150,000 in expenses for agreements conducting similar work. The red circles in Figure 6 indicate the overlaps in the period of performances between cooperative agreements with similar scopes of work.

²² During this audit, Columbia also found deficiencies in its internal controls including lack of segregation of duties and poor review of purchases and made changes to its administrative processes. In 2016, another Columbia administrative person working on the GISS agreement was fired in part due to poor financial management and other factors.

²³ GISS limited the Columbia employee's duties to ensure he was not allowed to actually commit NASA funds, a task instead accomplished by a NASA civil servant.

Figure 6: Cooperative Agreement Extensions



Source: OIG Analysis of NASA data.

In our judgment, the questionable expenses incurred by Columbia were largely the result of inadequate guidance and training provided by NASA to the Agency technical officers and the university principal investigators, as well as Columbia’s difficulty in effectively budgeting and projecting spending for research tasks. NASA guidance for cooperative agreements does not require Agency technical or grant officers, or the recipient’s principal investigators, to perform detailed financial reviews.²⁴ We also found GISS has no senior-level administrator whose primary responsibility is to manage the Institute’s 14 active grants and cooperative agreements. Instead, GISS’ 29 civil servants are mostly research scientists who focus on their science rather than the administrative tasks associated with managing multiple procurement actions. Specifically, the GISS Deputy Chief is a senior researcher with a primary responsibility for supervising research scientists, not handling the administrative aspects of the agreements and grants GISS oversees. Instead, these tasks are performed primarily by a GISS resource analyst or by the individual grant recipients’ financial administrators.

²⁴ NASA’s Guidebook for Proposers Responding to a NASA Funding Announcement, revised as of April 2017. NASA’s guidance to grant recipients consists of this very general but inclusive statement – “The Principal Investigator (PI) is the individual a research organization designates as having an appropriate level of authority and responsibility for the proper conduct of the research, including the appropriate use of funds and administrative requirements such as the submission of scientific progress reports to the agency.”

Errors in GISS' Main Support Contract

In our review of the Institute's \$17 million support contract with Trinnovim, LLC, we found the following errors:

- *Mischarge of Trinnovim employee:* From August 2016 through August 2017, we found that Trinnovim made \$137,785 in payments to a full-time Trinnovim employee who also worked full time for another organization not affiliated with GISS. In addition, although being paid as a full-time Deputy Project Manager, the employee instead performed duties not clearly articulated in the contract's statement of work, including processing travel requests for Federal employees.
- *Inappropriate costs for foreign national permanent residency:* We found Trinnovim inappropriately billed NASA \$9,353 for application and legal fees for a foreign national GISS employee to gain permanent residency status in the U.S. Given that the employee had worked at GISS as a Trinnovim employee for several years, these expenses – billed as direct costs to NASA – are not allowable according to FAR guidance.

In our judgment, the errors in the Trinnovim contract are partly attributed to the GISS Contracting Officer's Representative failure to review key financial records such as copies of receipts for direct costs claimed on invoices. Without access to these documents, a proper review of expenses could not be performed. Moreover, the Contracting Officer's Representative was unsure of the roles and responsibilities of Trinnovim employees under the contract including their job assignments. In addition, through our interviews of both contractors and NASA civil servants and a review of contract related communications, we found personal animosity between the contractor's corporate management and several GISS employees that may have hindered effective communication between the two groups.

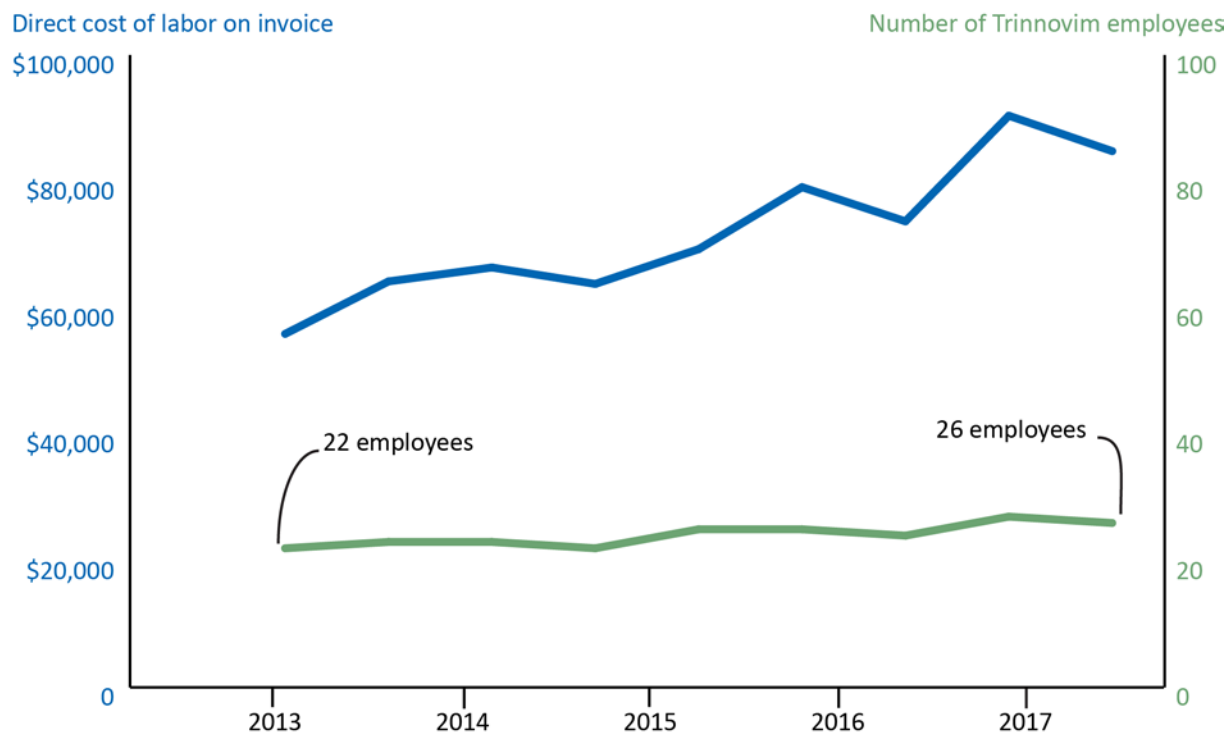
Another factor compounding the oversight shortcomings discussed above is that the support contract is a cost-type contract that requires greater oversight than a fixed-price contract. In particular, cost-type contracts involve oversight of pay rates and time and attendance, where oversight of a fixed-price contract only requires oversight of the timeliness and quality of work products. Specifically, the Trinnovim contract is a Cost-Plus-Fixed-Fee contract under which the contractor is reimbursed for all allowable costs.²⁵ According to the FAR, a cost-plus contract should be used when firm requirements cannot be established because this contract type provides flexibility for increasing or decreasing the amount of contracted work. GISS has used a cost-plus contract with its support contractors for over 15 years, initially because the level of effort for research or studies was unknown. As requirements and work routines stabilize over time, the Government entity can transition to a fixed-price contract because historic cost or pricing information permits realistic estimates of the probable costs of future performance.²⁶

²⁵ FAR, Part 16, Paragraph 16.306. Cost-Plus-Fixed-Fee Contracts, 16.306: "A cost-plus-fixed-fee contract is a cost-reimbursement contract that provides for payment to the contractor of a negotiated fee that is fixed at the inception of the contract... This contract type permits contracting for efforts that might otherwise present too great a risk to contractors, but it provides the contractor only a minimum incentive to control costs."

²⁶ FAR, Subpart 16.2. Fixed-Price Contracts, 16.202-2 Application: "A firm-fixed-price contract is suitable for acquiring... services on the basis of reasonably definite functional or detailed specifications... when the contracting officer can establish fair and reasonable prices at the outset, such as when... (b) There are reasonable price comparisons with prior purchases of the same or similar supplies or services made on a competitive basis."

Per the FAR, a cost-plus-fixed-fee contract requires more oversight and review of expenditures than a fixed-price contract.²⁷ GISS officials told us they liked the flexibility of a cost-plus contract because additional technical tasks could be added and previous tasks dropped as research requirements changed. However, while the effort required from the main support contractor may have been unknown when climate modeling was a new and evolving concept in the 1970s and 1980s, the amount of support has since become more routine and predictable. In both our interviews with NASA and Trinnovim officials and our review of work tasks we found a well-established, stable work force undertaking relatively routine tasks. However, as illustrated in Figure 7, although the amount of work performed by the contractor remained stable, the number of employees and labor costs have slowly grown. Our previous reporting has shown this is a routine occurrence in cost-plus contracts if costs are not controlled through effective Government oversight.²⁸ In our judgment, Goddard should consider moving to a fixed-price contract to reduce expenses because it provides maximum incentive for the contractor to control costs and perform effectively with minimum administrative burden on GISS and NASA.

Figure 7: Trinnovim Contract Resource and Cost Stability over the Period of the Contract



Source: OIG analysis of NASA and Trinnovim data.

²⁷ FAR, Subpart 16.2. Fixed-Price Contracts, 16.202-1 Description. A firm-fixed-price contract provides for a price that is not subject to any adjustment on the basis of the contractor's cost experience in performing the contract. This contract type places upon the contractor maximum risk and full responsibility for all costs and resulting profit or loss and provides maximum incentive for the contractor to control costs and perform effectively while imposing minimum administrative burden on the contracting parties.

²⁸ NASA OIG, "Cost Incurred on NASA's Cost Type Contracts" (IG-15-010, December 17, 2014).

Poor Accountability for IT Equipment Purchased using the Government Charge Card

GISS routinely uses the Government P-card for purchases of expensive computer equipment for NASA and Columbia researchers, yet we found 54 IT items that had not been entered into NASA's equipment accounting system known as the Property, Plant and Equipment (PP&E) System.²⁹ Goddard property guidance requires that all IT equipment should be tagged upon receipt and entered into the inventory system as soon as possible by the Goddard Property Manager's support contractor.³⁰ However, we found that no GISS computer purchases acquired since August 2014 have been entered into the PP&E System. An inaccurate asset inventory can lead to loss of property and data. Beginning in January 2018, Goddard managers worked with GISS officials to enter all of the property into the accounting system, completing the last two items just before this audit report's publication.

We also found that a GISS P-card holder may have used "split purchases" to buy IT equipment and services – a practice considered improper and one that according to NASA directives could result in the cardholder losing their card privileges. In a split purchase, the cardholder intentionally evades the threshold for an individual purchase by breaking it into multiple, smaller purchases.³¹ From October 2014 through June 2017, GISS cardholders purchased over \$130,000 in IT-related items, including laptops, storage devices, and software. Of this total, GISS cardholders purchased \$15,213 worth of equipment and services through three split purchases to apparently avoid the purchase limit of \$3,500 for such equipment.³² According to NASA policy, GISS employees should not have used a P-card to purchase IT equipment above the threshold amount and instead should have acquired it through a NASA purchase request process using a pre-approved vendor from which NASA has already secured the best price for the government.

²⁹ This included selected purchases for the \$50,000 GISS "Hyperwall," a tiled display or visualization system with a resolution of up to 9600 x 3240 used to display, analyze, and study high-dimensional datasets in meaningful ways.

³⁰ NPR 4200.1H, NASA Equipment Management Procedural Requirements (March 8, 2017), states that all equipment purchased or acquired should be processed through the Center's central receiving station, tagged upon receipt and acceptance, and entered into the PP&E equipment accounting system. Goddard officials told us that contractors have four days to process the details into the PP&E system. Since GISS is remotely located they can receive equipment directly, but tagging and recording the equipment should be done as soon as possible.

³¹ NASA Goddard Purchase Card Program Policy, Document #210-PCARD, April 2, 2017, revision 10.

³² The three split purchases consisted of six individual purchases made for two computer servers (\$5,073.84), two computer central processing units (\$3,752.54), and two software licenses (\$6,386.70).

NASA LACKS FORMAL STRUCTURES TO ENHANCE COLLABORATION IN CLIMATE MODELING

GISS collaborates with public and private institutions on an ad hoc basis to achieve NASA's strategic research goals. However, we found that the Institute is missing opportunities to partner with other Federal agencies and entities that conduct similar work because NASA lacks the long-term interagency agreements needed to set goals and objectives and provide funding. In our judgment, improved coordination may lead to efficiencies across agencies that conduct similar climate research and modeling.³³

We found that researchers from organizations such as NCAR and GFDL have an interest in increasing their coordination with NASA and that organizations currently working with GISS such as the Department of Energy and Massachusetts Institute of Technology would like to continue research they have conducted with GISS scientists. However, the current methods of seeking collaboration – such as responding to single research proposals, attending conferences or one-on-one interactions – are not effective at securing management support and funding. According to the researchers we spoke with, following these low-level, bottom-up approaches to collaboration can take up to a year to complete or never materialize at all due to competing funding priorities.

GISS officials said that while they would like to expand collaboration with other Federal agencies and outside entities, interagency agreements that could help align climate research ongoing at individual agencies do not exist. For example, a GISS official said he sought to work with the Federal Aviation Administration on mitigation of climate effects on air travel, but the effort fell through due to a lack of Federal Aviation Administration funding and the absence of an overarching memorandum of understanding between the agencies.

Despite the capabilities to establish partnerships at the Agency level, we found that NASA is not following the Government Accountability Office's (GAO) recommended best practices for establishing interagency or international partnerships for GISS (see Figure 8). Although some aspects of the eight practices can be found in its individual agreements and grants, GISS lacks an overarching agreement with other Federal agencies and entities with whom it routinely collaborates. Without such an overarching agreement, GISS has not capitalized on GAO best practices such as defining common outcomes, developing joint strategies, establishing compatible policies, and assigning roles and responsibilities for each agency. For example, GISS mentions the importance of working with both NOAA's GFDL at Princeton University and the National Science Foundation's NCAR in its five-year plans for modeling, yet has no active agreement for collaborative efforts with either of those entities. Given that NASA provided \$8.6 million or 6 percent of NCAR's budget in 2017, we expected to find a

³³ Although organizations such as the IPCC, United States Global Change Research Program and the World Climate Research Program can coordinate high-level strategies on an international or national basis, the agreements to enable long-term agency-to-agency partnerships do not exist.

document describing joint goals and expected outcomes. Instead, we found 19 different grants and contracts between Goddard and NCAR focused on a myriad of research topics.

Figure 8: GAO Practices to Enhance and Sustain Collaborative Efforts

1. **Common Outcomes:** Define and articulate a common outcome.
2. **Joint Strategies:** Establish mutually reinforcing or joint strategies designed to help align activities, core processes, and resources to achieve a common outcome.
3. **Leverage Resources:** Identify and address needs by leveraging resources to support the common outcome and, where necessary, opportunities to leverage resources.
4. **Roles and Responsibilities:** Agree on roles and responsibilities, including leadership.
5. **Compatible Policies:** Establish compatible policies, procedures, and other means to operate across agency boundaries, including compatible standards and data systems, and communicate frequently to address such matters as cultural differences.
6. **Monitor:** Develop mechanisms to monitor, evaluate, and report on the results of the collaborative effort.
7. **Reinforce Agency Accountability:** Reinforce agency accountability for collaborative efforts.
8. **Reinforce Individual Accountability:** Reinforce individual accountability for collaborative efforts through performance management systems by identifying competencies related to collaboration and setting performance expectations for collaboration.

Source: GAO, "Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies" (GAO-06-15, October 21, 2005).

The NASA entity responsible for facilitating this type of coordination – the Office of International and Interagency Relations – relies on researchers to approach the office for the accomplishment of partnerships and has not been approached by GISS to establish a strategic partnership with the Agencies with which it works. Rather, we found Goddard and GISS officials conducted collaboration activities on an ad hoc basis and any formalized agreements were part of a competitive award or reimbursable agreement.

In an environment where multiple science organizations are working on similar issues, ongoing communication and collaboration can enhance efficiency. The Institute's collaborations with other Federal agencies are generally limited to instances when a GISS researcher is awarded funding by another agency for a specific project. For example, GISS receives reimbursements for two grants from the Department of Energy that focus on modeling clouds and deep convection or thermally driven mixing of air in the atmosphere because the grants were awarded to GISS researchers.

CONCLUSION

With its climate modeling and prolific publication of scientific research, GISS plays an important role in helping NASA advance the understanding of Earth and make long-range predictions related to Earth's atmosphere and climate. Due to its off-site location in New York City, GISS was able to form productive partnerships with researchers at Columbia and other universities that have lasted nearly 60 years and produced significant research findings. However, we found flaws in GISS' review process for releasing scientific information and publications. Given NASA's key role in the science of global climate change, independent reviews and timely approval of STI are critical to avoid publication of erroneous information that could affect NASA's credibility and the scientific research undergirding the worldwide discussion of global climate change. Moreover, based on our discovery of \$1.63 million in questionable costs for GISS' agreements and contracts, and the loose accountability related to the purchase and tracking of computer equipment obtained using the Government P-card, we are concerned with the sufficiency of NASA's financial oversight of GISS. Finally, although we determined that GISS has significant ad hoc collaborations with public and private institutions, more comprehensive agreements using GAO's best practices would enhance GISS' climate modeling and research activities with agencies that conduct similar work, potentially avoiding duplicative costs.

RECOMMENDATIONS, MANAGEMENT'S RESPONSE, AND OUR EVALUATION

In order to ensure accurate scientific information is released to the public and to prevent sensitive information from inadvertent release, we recommended NASA's Chief Information Officer and the Chief of GISS:

1. Ensure all NASA and GISS-generated publications complete a thorough and independent pre-publication review and approval process prior to release.

To strengthen NASA's controls over the management of GISS funds, we recommended the Executive Director of the NSSC:

2. Remedy the \$1.47 million in unallowable costs identified in NASA's GISS-related cooperative agreements with Columbia.
3. Provide additional training for GISS managers, principal investigators, and technical officers regarding proper execution of cooperative agreements and grants.

In addition, we recommended that the Goddard Space Flight Center Director:

4. Hire a senior administrator to serve as a Deputy Chief of GISS for Administration to manage the Institute's grants, cooperative agreements, personnel, and procurement actions.

To recover funds spent on unallowable expenses, we recommended the Goddard contracting officer who handles the GISS IT contract:

5. Remedy the \$147,138 from Trinnovim, LLC for unallowable salaries and immigration fees.

In order to increase accountability and control of GISS' use of Government P-cards, we recommended that the Goddard Space Flight Center Director and Chief of GISS:

6. Ensure all Institute equipment is entered into NASA's equipment accounting system.
7. Counsel card holders and approving officials to follow Government P-cards rules and in particular avoid split purchases.

To improve GISS' partnership management and leverage collaboration, we recommended that the Associate Administrator for the Science Mission Directorate and the Goddard Space Flight Center Director, in coordination with the Associate Administrator of the Office of International and Interagency Relations:

8. To the extent practicable, implement the GAO's best practices for establishing partnerships, including the formalization of agreements that outline the roles and responsibilities of each agency in the performance and application of climate research performed at GISS.

We provided a draft of this report to NASA management who concurred or partially concurred with our recommendations and described planned corrective actions. We consider the proposed actions responsive for all eight recommendations and will close them upon verification and completion of those actions. In addition, we provided Columbia University with a copy of the draft report for their review and comment.

Responses by NASA management and Columbia University to our report are reproduced in Appendices E and F. Both entity's technical comments have been incorporated, as appropriate.

Major contributors to this report include Ridge Bowman, Space Operations Director; Kevin Fagedes, Project Manager; Susan Bachle, Team Leader; Mike Beims; Shari Bergstein; Frank Martin; Alyssa Sieffert; and Cedric Campbell. Matt Ward provided editorial and graphics assistance.

If you have questions about this report or wish to comment on its quality or usefulness, contact Laurence Hawkins, Audit Operations and Quality Assurance Director, at 202-358-1543 or laurence.b.hawkins@nasa.gov.

A handwritten signature in black ink, appearing to read 'PKMA', is positioned above the printed name and title of Paul K. Martin.

Paul K. Martin
Inspector General

APPENDIX A: SCOPE AND METHODOLOGY

We performed this audit from May 2017 through March 2018 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence that provides a reasonable basis for our findings and conclusions. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Our overall audit objective was to examine NASA's management of the Goddard Institute for Space Studies. Specifically, we assessed how GISS (1) supports NASA's science goals and objectives, (2) complies with NASA's standards for the public release of scientific and technical information, (3) uses appropriated and non-appropriated funds in support of its mission, and (4) coordinates its research with NASA, other Federal agencies, and members of the scientific community. Our review was conducted at GISS, Goddard, and NASA Headquarters.

To determine whether GISS and its supporting activities were meeting NASA's science goals, we reviewed NASA and GISS mission, goals, and objectives documentation. Specifically, we reviewed the NASA Strategic Plan 2014, NASA 2014 Science Plan, Earth Science and Applications from Space: A Midterm Assessment of NASA's Implementation of the Decadal Survey, and the 2012 GISS Global Climate Modeling Core Support proposal. To determine GISS' progress towards completing NASA's goals, we reviewed the GISS website and GISS' publications to determine the project topics researched by GISS personnel. In addition, we interviewed officials at NASA Headquarters, Goddard, and GISS, who explained how the GISS mission relates to NASA's overall science goals.

To examine the STI process, we first reviewed NASA's criteria for STI – NASA Policy Directive (NPD) 2200.1C – and then located all GISS publications that were released during FY 2016 and FY 2017 and checked their status in the NASA Technical Reports Server. These included all forms of STI such as papers published in journals and material for presentation at conferences. Then, we conducted interviews with the STI manager at Goddard and the Chief of GISS to gain their perspective especially given GISS had already undergone an internal STI audit. Following this, we conducted two samples – first, we examined each aspect of seven STI publications where the author was the Chief of GISS and then, we examined when the approval was made for all publications in respect to their actual release date. With access to the Technical Reports Server, we were able to confirm the exact date the STI was approved, when it was released for publication and if it was a first time publication.

To assess whether GISS appropriated and non-appropriated funds are being used correctly, we reviewed GISS budget documentation, along with GISS obligation and disbursement data for FY 2014 through FY 2017. Specifically, for the GISS budget, we reviewed through NASA's accounting system the funds used to support GISS activities, including appropriated funds to GISS, and Goddard funding to support activities such as leasing, security, and supercomputer use, along with reimbursable agreements. We conducted interviews with Goddard officials and the GISS resource analyst. To determine how GISS spends their funding, we obtained GISS disbursement data from NASA's accounting system and analyzed funds spent towards salaries and travel, contracts, cooperative agreements, grants, and small procurement actions to include P-cards. We validated our findings with the GISS resource analyst. For travel expenses, we obtained a sample of travel records to identify any expenses that should not have been claimed as government travel. For contracts, we analyzed the Trinnovim contract and invoices to

determine whether any expenses were erroneously charged. We reviewed the Federal Acquisition Regulation (FAR) and NASA FAR supplement to ensure the contract actions were in accordance with policy. We interviewed the Goddard contracting officers and GISS contracting officer technical representative, along with Trinnovim, LLC officials.

For cooperative agreements and grants, we obtained the Columbia University general ledger, payroll data, and employee effort cards to determine whether Columbia made any unallowable, unreasonable, and unallocable charges in accordance with 2 CFR 200, the NASA Grant and Cooperative Agreement Handbook, and the Grant and Cooperative Agreement Manual. We also reviewed prior OIG work on NASA's management of cooperative agreements and grants. We interviewed the Columbia University Deputy Controller, Columbia financial analysts, principal investigators, and NASA technical officers.

For the small procurement actions that we identified in the disbursement data, we interviewed GISS officials to obtain explanations of the charges and supporting documentation. In addition, we obtained the P-card transactions for the GISS P-card holders from October 1, 2014, through June 30, 2017, and judgmentally selected a sample of transactions for review of the official files. We also reviewed the Goddard and NSSC purchase card policies to determine whether the purchases were made in accordance with policy. We interviewed Goddard P-card officials to gain an understanding of the policies. We then interviewed Goddard property management officials to gain an understanding of their policies for tracking the equipment purchased by GISS P-card holders.

To assess whether GISS coordinates their activities with NASA, other federal agencies, and members of the scientific community, we reviewed program documentation for other NASA modeling activities, and conducted interviews with NASA Office of International and Interagency Relations officials, Columbia University representatives, and outside agencies. Specifically, we interviewed Federal officials within the Department of Energy, the Department of Transportation, and the National Science Foundation, along with officials within the scientific community at entities such as the GFDL and NCAR.

Use of Computer-Processed Data

We used computer processed data to perform this audit, and that data was used to materially support findings, conclusions, and recommendations. Specifically, we analyzed GISS budget data from FY 2014 through FY 2017 in the form of Excel spreadsheets received from NASA officials. We then verified that data with NASA's accounting system. In addition, we reviewed NASA obligation and disbursement data for FY 2013 through FY 2017 in NASA's accounting system for GISS salaries, travel expenses, cooperative agreements and grants, Trinnovim and SciSpace contracts, and small procurement actions. We verified the data with the GISS budget analyst and through independent calculations. We also obtained general ledger data from Columbia University for FY 2013 through FY 2017 for the cooperative agreements and grants that were active during that time period.³⁴

³⁴ Unlike the Federal Government's fiscal year of October 1st through September 30th, Columbia's fiscal year is July 1st through June 30th.

Review of Internal Controls

We evaluated the internal controls associated with NASA's management of GISS, including the cooperative agreements, contracts, and P-cards. The control weaknesses we identified are discussed in this report. Our recommendations, if implemented, will correct the identified control weaknesses.

Prior Coverage

During the last 5 years, NASA OIG has issued one report of significant relevance to the subject of this report. We found five additional relevant reports issued prior to 2013 from NASA OIG and GAO. Unrestricted reports can be accessed at <https://oig.nasa.gov/audits/reports/FY18> and <http://www.gao.gov>.

NASA Office of Inspector General

Costs Incurred on NASA's Cost-Type Contracts (IG-15-010, December 17, 2014)

Audit of NASA's Purchase and Travel Card Programs (IG-12-010, February 16, 2012)

NASA's Grant Administration and Management (IG-11-026, September 12, 2011)

Actions Needed to Ensure Scientific and Technical Information Is Adequately Reviewed at Goddard Space Flight Center, Johnson Space Center, Langley Research Center, and Marshall Space Flight Center (IG-08-017, June 2, 2008)

Goddard Institute for Space Studies (GISS) Programs and Operations (GO-95-003, February 24, 1995)

Government Accountability Office

Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies (GAO-06-15, October 21, 2005)

APPENDIX B: GISS RESOURCES AND EXPENDITURES

Table 2 provides the resources available to GISS from FY 2014 through FY 2017. As indicated in the table, the resources have remained relatively stable over the last four years.

Table 2: Funding Resources Available to GISS from FY 2014 through FY 2017

	FY 2014	FY 2015	FY 2016	FY 2017
Appropriated Funds (Subtotal)	\$14,508,442	\$13,183,124	\$14,516,309	\$15,459,975
ModelE	\$6,200,000	\$5,300,000	\$5,863,793	\$6,930,000
Individual Projects	\$712,139	\$714,347	\$1,041,890	\$928,705
Proposals	\$5,697,275	\$5,234,091	\$5,985,418	\$5,870,990
Other FTEs ^a	\$1,285,139	\$1,456,073	\$1,185,759	\$1,286,389
Institutional Funds	\$613,889	\$407,761	\$409,300	\$409,300
Education Initiatives	\$0	\$70,852	\$30,149	\$34,591
Reimbursable Agreements	\$191,750	\$551,981	\$307,832	\$530,797
Columbia University Support	\$486,751	\$311,335	\$506,640	\$331,039
Other NASA Funds (Subtotal)	\$2,279,630	\$3,549,278	\$3,778,267	\$3,233,236
Leasing Agreement	\$1,789,615	\$1,799,671	\$1,823,408	\$1,824,343
Security Services	\$475,596	\$440,045	\$440,044	\$464,906
Supercomputer Use	\$14,419 ^b	\$1,309,562	\$1,514,815	\$943,987
Total	\$17,466,573	\$17,595,718	\$19,109,048	\$19,555,047

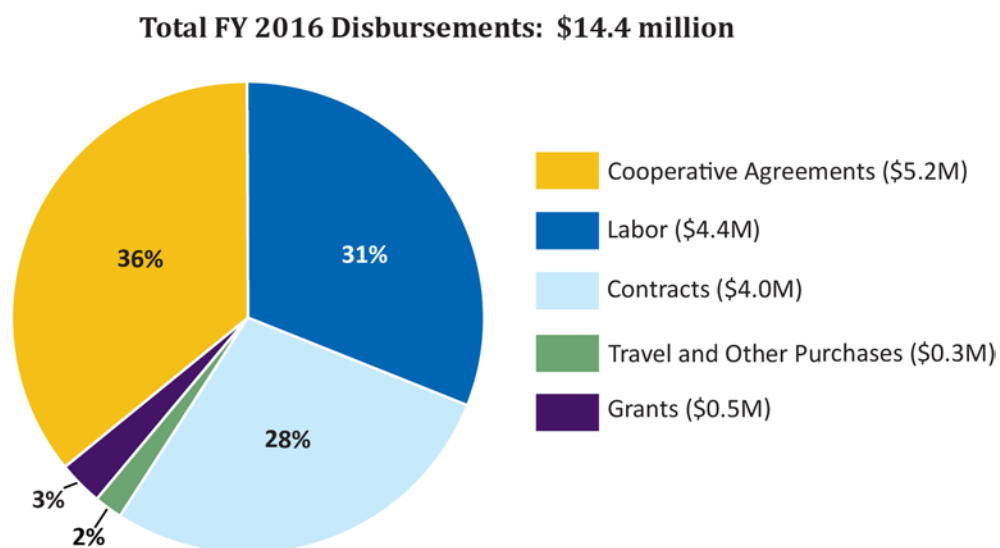
Source: OIG analysis of NASA data.

^a Other FTEs include institutional, investment, and research full-time equivalent positions.

^b GISS utilizes the supercomputers at Ames Research Center and Goddard. The FY 2014 supercomputer use cost only includes Ames Research Center's support and does not include Goddard's support.

GISS Annual Expenses

GISS' annual budget is used to fund the following types of expenses: (1) cooperative agreements with universities, (2) grants with universities, institutes, and non-profits, (3) main support contract with Trinnovim/SciSpace, (4) civil servant labor and travel and (5) other procurements. Specifically, in FY 2016, NASA spent approximately \$14.4 million on these expenses. Figure 9 portrays the breakout for these expenses in FY 2016, which shows that approximately 40 percent of the disbursements are to fund the cooperative agreements and grants.

Figure 9: Breakout of GISS Disbursement for FY 2016

Source: OIG analysis of NASA's Accounting System reports.

Note: The disbursements reflected above do not include Columbia funding, other NASA funds, or the reimbursable agreement funds that have ranged from a low of \$200,000 to a high of \$550,000 per year over the past four years.

APPENDIX C: GISS CONTRACTS, COOPERATIVE AGREEMENTS, AND GRANTS

The tables below provide the specifics on GISS contracts, cooperative agreements and grants. The award amounts and the funding obligated for each GISS supported contract are shown in Table 3. The costs associated with each GISS supported cooperative agreement and grants between FY 2014 through FY 2017 are shown in Table 4 and Table 5, respectively. As of April 2018, four cooperative agreements and ten grants are being funded and remain active. These awards include a range of research studies, such as support for the NASA Astrobiology Magazine from the Art Science Research Laboratory, examining the effects of aerosols on the ozone with Duke University, and understanding the habitability of rocky planets with Columbia University.

Table 3: GISS Contracts Active from FY 2014 through FY 2017

Contract Number	Contractor	Award Date	POP End Date	Contract Type	Award Amount for Total Contract	Amount Obligated at GISS through 02/06/2018
NNG12HP07C	Trinnovim	04/01/2012	09/30/2017	Cost Plus Fixed Fee	\$17,046,900	\$16,869,602
NNG12PL17C	ADNET Systems	08/27/2012	09/30/2017	Cost Plus Fixed Fee	\$250,586,279	\$326,798 ^a
NNG13AZ05C	Alutiiq Pacific	04/01/2013	03/31/2018	Firm Fixed Price	\$66,794,504	\$63,222,662
Total Obligated at GISS						\$80,419,062

Source: NASA.

^a The ADNET Systems contract supports all of Goddard and GISS only utilizes a small portion of the contract for one on-site support employee. This cost is the amount spent through December 2017.

Table 4: GISS Cooperative Agreements Active from FY 2014 through FY 2017

Award Number	Recipient	Start Date	End Date	Status	Award Amount
NNX10AU63A	Columbia University	09/01/2010	08/31/2014	Closed	\$7,068,001
NNX11AR63A	Columbia University	09/02/2011	09/01/2014	Closed	\$4,747,936
NNX12AB01A	Columbia University	09/30/2011	12/31/2016	Closed	\$1,592,411
NNX12AB87A	Columbia University	11/28/2011	05/31/2015	Closed	\$4,512,482
NNX12AR20A	Columbia University	09/05/2012	04/30/2016	Closed	\$980,739
NNX13AH91A	Massachusetts Institute of Technology	03/01/2013	02/28/2017	Closed	\$925,078
NNX14AB99A ^a	Columbia University	03/28/2014	09/30/2017	Closed	\$10,167,254
NNX15AJ05A	Columbia University	06/01/2015	05/31/2018	Active	\$7,542,315
NNX15AJ51A	Duke University	05/01/2015	04/30/2018	Active	\$585,361
80NSSC17M0075	Massachusetts Institute of Technology	09/08/2017	09/07/2020	Active	\$1,118,425
Total					\$39,240,002

Source: NASA.

^a The follow-on to this agreement (award number 80NSSC17M0057) started in FY 2018 (October 1, 2017).

Table 5: GISS Grants Active from FY 2014 through FY 2017

Award Number	Recipient	Start Date	End Date	Status	Award Amount
NNX13AQ25G	Research Foundation of The City University of New York	08/07/2013	08/06/2016	Closed	\$254,291
NNX15AD61G	Stevens Institute of Technology	01/01/2015	06/30/2016	Closed	\$89,668
NNX15AG47G	Art Science Research Laboratory	02/25/2015	02/24/2019	Active	\$476,352
NNX15AK95G	Columbia University	05/15/2015	05/14/2020	Active	\$648,631
NNX15AM87G	Planetary Science Institute	06/03/2015	06/02/2020	Active	\$278,730
NNX15AN35G	University of Washington	06/19/2015	06/18/2020	Active	\$203,926
NNX15AN37G	Weber State University	06/19/2015	06/18/2020	Active	\$86,293
NNX15AP96G	Association of Universities for Research in Astronomy	07/10/2015	07/09/2018	Active	\$99,200
NNX15AU95G	Southwest Research Institute	08/26/2015	08/25/2020	Active	\$274,570
NNX15AQ10A	University of Massachusetts	09/01/2015	08/31/2016	Closed	\$9,892
NNX16AC41G	Dartmouth College	12/01/2015	11/30/2016	Closed	\$68,730
NNX16AK38G	University of Chicago	06/01/2016	05/31/2019	Active	\$126,941
NNX16AT72G	Climate, Aerosol & Pollution Research	09/15/2016	09/14/2018	Active	\$117,314
NNX17AC81G	Research Foundation of The City University of New York	12/05/2016	03/04/2017	Closed	\$10,000
NNX17AJ12G	Research Foundation for the State University of New York	03/24/2017	03/23/2020	Active	\$70,066
Total					\$2,814,604

Source: NASA.

APPENDIX D: SCHEDULE OF QUESTIONED COSTS/DOLLAR-RELATED FINDINGS

Table 6 summarizes the questioned costs identified during our audit and discussed in this report. These costs are the result of the unallowable use of cooperative agreement, contract, and P-card funds.

Table 6: Questioned Costs and Associated Recommendations

Issue	Recommendation #	Questioned Costs
Unallowable cooperative agreement funds spent by Columbia for graduate tuition and fees.	2	\$633,073.34
Unallowable cooperative agreement funds spent by Columbia for a sub-contract.	2	\$82,093.62
Unapproved increase in costs for two subcontracts in a cooperative agreement.	2	\$248,363.87
Unreasonable cooperative agreement funds spent by Columbia to pay for salaries of short-term casual employees.	2	\$255,960.58
Unreasonable cooperative agreement funds remaining on an active agreement when the work was completed under the predecessor agreement.	2	\$62,481.99
Unallowable cooperative agreement funds spent by a former Columbia administrative employee on unaccounted for computer equipment.	2	\$18,668.00
Unallocable cooperative agreement funds spent by Columbia to pay for the salary of an administrative employee that was not performing work on the agreement.	2	\$168,013.00
Unreasonable contract funds spent by Trinnovim to pay for the salary of an employee that was performing duties outside of the contract's scope of work and was employed full-time by another organization.	5	\$137,785.35
Unallowable contract funds spent by Trinnovim to pay for foreign national permanent residency application and legal fees.	5	\$9,352.83
Unallowable Government P-card charges through 3 split-purchases for IT equipment and services.	7	\$15,213.08
Total		\$1,631,005.66

Source: OIG Analysis.

Note: Questioned Costs are expenditures that are questioned by the OIG because of an alleged violation of law, regulation, or contractual requirement governing the expenditure of funds, costs that are not supported by adequate documentation at the time of our audit, or are unallowable, unnecessary, or unreasonable.

APPENDIX E: MANAGEMENT'S COMMENTS

National Aeronautics and Space Administration
Headquarters
 Washington, DC 20546-0001



MAR 30 2018

Reply to Attn of:

Science Mission Directorate

TO: Assistant Inspector General for Audits

FROM: Associate Administrator, Science Mission Directorate

SUBJECT: Agency Response to OIG Draft Report, "NASA's Management of the
 Goddard Institute for Space Studies" (A-17-015-00)

The National Aeronautics and Space Administration (NASA) appreciates the opportunity to review and comment on the Office of Inspector General (OIG) draft report entitled, "NASA's Management of the Goddard Institute for Space Studies" (A-17-015-00), dated February 28, 2018.

In the draft report, the OIG makes eight recommendations to NASA intended to improve the overall management of the Goddard Institute for Space Studies (GISS).

Specifically, the OIG recommends the following:

In order to ensure accurate scientific information is released to the public and to prevent sensitive information from inadvertent release, the OIG recommends that NASA's Chief Information Officer (CIO) and the Chief of GISS:

Recommendation 1: Ensure all NASA and GISS-generated publications complete a thorough and independent pre-publication review and approval process prior to release.

Management's Response: Partially concur. NASA Policy Directive (NPD) 2200.1, "Management of NASA Scientific and Technical Information," provides for the "widest practicable and appropriate dissemination" of scientific and technical information resulting from NASA's research effort, while precluding the inappropriate dissemination of NASA's restricted and sensitive information. Additionally, NASA Procedural Requirements (NPR) 1080.1, "Requirements for the Conduct of NASA Research and Technology (R&T)," stipulates that NASA researchers and project staff are expected to share their results with their peers and colleagues at professional meetings, science conferences, and other venues.

Scientific publications, such as journal articles, routinely undergo an independent peer-reviewed process. GISS-generated journal articles follow this practice, and we will continue to ensure a thorough and independent peer-review process prior to publication and release. These publications will be available on the NASA Technical Report Server, as well as the National Institutes of Health (NIH) PubMed repository, along with other NASA-funded peer-reviewed publications.

However, NASA publishes many non-scientific documents that are not considered candidates for an independent review process. Scientific or professional conference presentations do not, as a practice, undergo the same peer-review process as a journal publication. These presentations occur at regular intervals during the research, long before the publication phase, and serve to promote scientific discourse among independent researchers and inform and enhance the outcome of the research. These presentations need to be reviewed to ensure restricted or sensitive information is not released to the public, and the documents are stored on the NASA Technical Report Server for internal and external access. Pre-approval of non-restricted information, such as the GISS-generated scientific research, requires management approval, but not independent review.

The non-compliant Scientific and Technical Information (STI) Electronic Document Availability Authorization (EDAA) items highlighted in the report consist predominantly of conference presentations which do not have the same pre-publication peer-review process as for published journal articles. GISS authors submitted their complete presentations, after the fact, through the system as a permanent record. However, the EDAA system is not intended to serve the purpose of independent peer-review to verify scientific findings but rather to prevent NASA's restricted or sensitive information being released to the public.

NASA's Chief Information Officer and the Chief of GISS will work together to leverage the STI review and approval process to prevent the release of restricted and sensitive information for publications and presentation material, and the Chief of GISS will continue to ensure GISS-generated journal articles follow independent peer-reviewed standards of practice.

Estimated Completion Date: Ongoing.

To strengthen NASA's controls over the management of GISS funds, the OIG recommends that the Executive Director of the NASA Shared Services Center (NSSC):

Recommendation 2: Remedy the \$1.47 million in unallowable costs identified in NASA's GISS-related cooperative agreements with Columbia.

Management's Response: Concur. NASA places the highest importance in correctly managing the numerous grants and cooperative agreements that support GISS research. Principal investigators, technical officers, and administrators for these agreements continually strive to adhere to applicable laws, regulations, and

Agency guidance in the execution of their duties. NASA will review the questioned costs and circumstances identified by the OIG with respect to the cooperative agreements with Columbia. Upon Agency determination of disallowed costs, if any, NASA will seek recovery, offsets against future awards, and/or implement controls and related process improvements to prevent instances of recurrence, as appropriate.

Estimated Completion Date: December 31, 2018

Recommendation 3: Provide additional training for GISS managers, principal Investigators, and technical officers regarding proper execution to Cooperative Agreements and Grants.

Management's Response: Concur. The proper and legal execution of grants and cooperative agreements is of the highest priority for NASA. The NSSC will continue to provide basic Grants Management training to the Technical community. Programmatic training is offered through Management Concepts Inc. for Grants and Cooperative Agreements. Goddard Space Flight Center (GSFC) will organize and mandate an annual briefing for NASA Program Managers (PM), Principal Investigators (PI), technical officers (TO), and NASA and collaborator administrative staff to cover these issues with input from the NSSC Counsel and the GSFC Procurement Office.

Estimated Completion Date: July 31, 2018 and annually thereafter.

In addition, the OIG recommends that the GSFC Director:

Recommendation 4: Hire a senior administrator to serve as a Deputy Chief of GISS for Administration to manage the Institute's grants, cooperative agreements, personnel, and procurement actions.

Management's Response: Concur. GISS/GSFC will develop a position description to hire a manager to oversee the grants, cooperative agreements, personnel, and procurement actions. We will work with the GSFC Office of Human Capital Management (OHCM) and the NSSC to have the Position Description classified, followed by posting of the vacancy announcement on USAJobs.gov. Once the hiring certificates are received, we will conduct proper interviews to find the best qualified candidate. As this process will most likely take several months to complete, the Director of GISS will appoint his Deputy as the administrative manager to oversee these critical actions in the interim. In addition, the GISS Deputy Director will work closely with the Resources Analyst at GISS to routinely review these related actions.

Estimated Completion Date: September 30, 2018

To recover funds spent on unallowable expenses, we recommend that the Goddard contracting officer who handles the GISS information technology (IT) contract:

Recommendation 5: Remedy the \$147,744 from Trinnovim LLC for unallowable salaries, immigration fees, and office supplies.

Management's Response: Concur. With respect to the questioned costs relating to unallowable salaries of the Trinnovim LLC employee, the Contracting Officer and Contracting Officer's Representative (COR) are aware of work appropriately performed by the employee under the corresponding contract. However, the related amount of salary corresponding with work performed under the contract is still yet to be determined. Once a determination has been made, the Contracting Officer will pursue recovery of salary costs not appropriately incurred under the contract. In addition, the Contracting Officer is reviewing the appropriateness of the costs associated with the foreign national naturalization application, legal fees, and office supplies identified in the report. If deemed unacceptable through this research, then the Contracting Officer will take actions to retrieve these costs.

To help alleviate situations like this from occurring on future contracts, specific training such as Contractor 533 Introductory or Contractor 533 Analysis classes will be instituted.

Estimated Completion Date: December 31, 2018.

In order to increase accountability and control of GISS's use of Government credit cards, the OIG recommends that the GSFC Director and Chief of GISS:

Recommendation 6: Ensure all Institute equipment is entered into NASA's property custodian system.

Management's Response: Concur. GISS management has already moved to ensure that locally tagged and logged items that fall within the purview of the NASA-wide Property, Plant & Equipment (PP&E) system are being entered. The backlog of items highlighted in the report has already been cleared, and information on any new purchases will be forwarded to the GSFC Equipment office in a timely fashion. GISS management has also instituted a parallel system for all non-NASA IT equipment in the GISS facility. GISS management will provide written guidance to all employees and the GISS property manager to ensure that all new purchases are entered into the PP&E system.

Estimated Completion Date: Completed.

Recommendation 7: Counsel card-holders and approving officials to follow Government purchase cards rules and in particular to avoid split purchases.

Management's Response: Partially Concur. Although NASA's review of the documentation provided is inconclusive as to whether or not split purchases were made, we concur with the recommendation to counsel card holders and approving officials to follow Government Purchase Card rules and, in particular, avoid split purchases. The NSSC Purchase Card Team will send e-mails to purchase cardholders reminding them of the policy to not split purchases. The e-mails will also provide guidance that, when a situation is encountered where different funds are being used, or where there are multiple organizations requesting the item or services, or where different delivery locations are required, the cardholder shall inquire with the NSSC for additional guidance. The reminder e-mails will also encourage the cardholders that, when instances of this nature are encountered, to add detailed documentation in the 'Comments' section of the order log as well as ensure that all documentation associated with the purchase is retained. Additionally, the number of Purchase Card holders at GISS has been reduced from five to two in order to enable better control of Purchase Card usage. Quarterly newsletters will be sent to the cardholders reminding them of policies such as this one.

Estimated Completion Date: April 30, 2018.

To improve its partnership management, and exploit similarities for collaboration, the OIG recommends that the Associate Administrator for Science Mission Directorate (SMD) in coordination with the Associate Administrator of the Office of International Affairs and Interagency Affairs (OIIR):

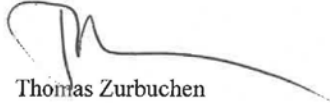
Recommendation 8: To the extent practicable, implement the GAO's best practices for establishing partnerships, including the formalization of agreements that outline the roles and responsibilities of each agency in the performance and application of climate research.

Management's Response: Concur. GISS will establish collaborative agreements, as appropriate, related to the performance and application of climate research by following the NASA partnerships process. The NASA partnerships process, as defined in the Space Act Agreement Guide (NASA Advisory Implementing Instruction 1050-1D) and the Partnerships Guide (NASA Advisory Implementing Instruction 1050-3A), aligns with the GAO best practices for establishing partnerships. It includes mechanisms to establish agreements, including formalization of language and definition of review and approval process within the Agency.

Estimated Completion Date: Ongoing.

We have reviewed the draft report for information that should not be publicly released. As a result of this review, we have not identified any information that should not be publicly released.

Once again, thank you for the opportunity to review and comment on the subject draft report. If you have any questions or require additional information regarding this response, please contact Peter Meister on (202) 358-1557.



Thomas Zurbuchen

cc:

Chief Information Officer/Ms. Wynn
Associate Administrator for International
and Interagency Relations/Mr. Condes
Goddard Space Flight Center Director/Mr. Scolese
NASA Shared Services Center Acting Executive
Director/Ms. Harrell

APPENDIX F: COLUMBIA UNIVERSITY'S COMMENTS

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK
OFFICE OF THE CONTROLLER AND TREASURER

March 30, 2018

Mr. James L. Morrison
Assistant Inspector General for Audits
NASA Office of Inspector General
Office of Audits
Suite 8U71, 300 E ST SW
Washington, D.C. 20546-0001

Subject: Draft Report, Audit of NASA's Management of the Goddard Institute for Space Studies
(A17-015-00)

Dear Mr. Morrison:

Columbia University ("Columbia") has reviewed the NASA OIG ("OIG") Audit Report A17-015-00 entitled Audit of NASA's Management of the Goddard Institute for Space Studies ("GISS"), for the period FY 2012 to FY2017 that OIG claims resulted in \$1.47 million in questionable expenses. The purpose of this audit according to the OIG introductory statement in the report was to perform a broader examination of the NASA's collaborations with universities and non-governmental entities, and to that end OIG examined NASA's management of GISS. In the report and during discussions there was a constant theme indicating that the audit team recognized that the core issue was the need to obtain the appropriate approvals within the NASA GISS management structure as opposed to the validity of the expenses. As Columbia understands it, in the OIG's judgment, " ...this inappropriate use of NASA funds was largely the result of insufficient oversight by the principal investigators and NASA's technical officers, and approving officials, coupled with the absence of a senior-level administrator at GISS to manage the Institute's grants and cooperative agreements." While Columbia disagrees with the conclusion that NASA funds were inappropriately used, we acknowledge that the lack of delineation of roles and responsibilities within NASA GISS, including those of NASA scientists with Columbia research appointments, has resulted in certain challenges.

Columbia has performed a detailed internal review of the transactions set forth in the section of the OIG report entitled, Questionable Expenses and Budgeting in NASA's Cooperative Agreements with Columbia. The processes followed and decisions made by the Columbia Principal Investigators (PIs) are consistent with the longstanding practices developed over the 57 years of the NASA GISS - Columbia relationship. Columbia believes that the expenditures are allowable, allocable and reasonable and were managed with the appropriate NASA and NASA GISS oversight, with the single exception of the improper financial transactions related to the Columbia Internal Audit Report that found the purchase of computer equipment was unallowable.

The details in the areas of disagreement are set forth below.

615 West 131st Street Studebaker Building, 3rd floor Mail Code 8736 New York, NY 10027

Columbia University
Response to NASA OIG
Questioned Costs
March 30, 2018

Unallowable Expenses

"Columbia spent \$1,219,491 on contract services, financial aid, and salaries for graduate students and short-term employees – all items not included in the cooperative agreement. Although use of these funds supported GISS objectives, the expenses were either outside the scope of the agreement or were not approved by the NASA grant officer before expenditure. Included in this total is \$633,073 for graduate tuition and fees that were not part of the cooperative agreement proposal and not approved by the NASA grant officer. Columbia and GISS officials had approved the budget change and, when questioned by OIG auditors, said under NASA criteria only significant changes in scope required notification to the grant officer. In our judgment, diverting over half a million dollars – 9 percent of the agreement's value – from research to pay for graduate student education should have been deemed "significant" and therefore routed to the NASA grant officer for approval."

Columbia Response:

Columbia disagrees with NASA OIG's determinations. Columbia PIs have relied on a longstanding practice by NASA GISS Directors to act as the ultimate authority with respect to the various Cooperative Agreements between NASA and Columbia. In this model, the PIs are under the direct oversight of GISS leadership, the NASA Director at GISS. The structure, as designed and agreed upon by NASA, is unique in that although the PIs are Columbia employees, their research, and programmatic decisions, are overseen and approved by GISS on an ongoing basis. In addition, over the past several years, the Columbia PIs have been embedded in the NASA GISS location working on awards which were approved and signed by NASA Technical Officers.

The funds spent on contract services, financial aid, and salaries were discussed and approved by the relevant NASA Officers at the GISS location and reported on Progress Reports which were submitted to NASA. In accordance with Section A, Part 1260, Grants and Cooperative Agreements under provision 1260.25(b) of the NASA Handbook, "Prior written approval is required from NASA if there is to be a significant change in the objective or scope." Columbia maintains with regard to this subject agreement that there was in fact no "significant change" in the objective or scope.

GISS Directors have recognized that the graduate students referenced above provided research support for the stated objectives and as such were not a diversion of funds but instead funded further research in support of the GISS operation. As noted by the Columbia University Sponsored Project Administration's Office and the Principal Investigators, the regulations are further evidence that the expenses charged are within the terms and conditions allowed under the award. With regard to subcontracts, which were appropriately issued under the A133 / Uniform Guidance regulations, the Principal Investigator is not required to seek prior approval unless there is a program change. We note that the cooperative agreements are broadly written to support the GISS mission across a range of program areas (including fundamental research, climate impacts, and graduate education).

Further, our position is that the term "a significant change" is determined by the percentage of questioned costs to the total budget under the agreement. In this instance, the \$633,073.34 amount stipulated as questioned costs is 8.91% of a \$7.1 million agreement and as such does not rise to the level of "a significant change" as stated in the regulations. Industry practice, particularly in higher

Columbia University
 Response to NASA OIG
 Questioned Costs
 March 30, 2018

education, with regard to determining a “significant change” is generally applied to the re-budgeting of items in excess of 25% of the approved budget allowing the PI to seek approval only when the amount reaches that threshold.

Unreasonable Expenses

“In an agreement on modeling and atmospheric circulation and cloud processes, Columbia spent \$62,482 on salaries and other expenses to pay for work conducted more than a year after the final project report was submitted. The final report was evaluated and approved by NASA in July 2015; however, in September 2016 NSSC approved an extension for the period of performance instead of de-obligating the remaining funds or transferring those funds to a follow-on agreement. To avoid a double payment for the same work, NSSC had planned to remove this portion of work from the follow-on agreement and reduce the award amount by \$62,482; however, this never occurred. After bringing this issue to the attention of NSSC officials, they agreed to complete the action to de-scope the follow-on agreement.”

Columbia Response:

Columbia disagrees with the NASA OIG’s determination. As noted, this agreement was granted a no cost extension. Columbia’s position is that the \$62,482 spent on salaries and other expenses, used to pay for work conducted, did not require prior approval and was within the PI’s authority since expenses did not meet the requirements for a significant change in scope as described above in the regulations. These salaries would have otherwise been applied to the follow-on agreement (which covers a similar ongoing program of research).

To address OIG concerns that there was any duplication of effort, we will initiate a descope of the current cooperative agreement by \$62,482 at the end of its period of performance.

Improper Financial Transactions

“A Columbia administrative employee working at GISS hired his spouse as a short-term Columbia employee who was improperly paid using cooperative agreement funds. In addition, the Columbia employee bought computer equipment totaling \$18,668 that later could not be immediately accounted for due to the lack of central inventory. Columbia discovered the improprieties in a 2015 internal University audit, fired the employee, and made restitution to NASA of \$72,939 in unallowable salary charges; however, it made no restitution for the computer purchases. During the course of our audit, Columbia University located four computers and confirmed the equipment is being used to support the cooperative agreements. In addition, the school agreed to repay NASA for the remaining unaccounted-for equipment.”

Columbia University
Response to NASA OIG
Questioned Costs
March 30, 2018

Columbia Response:

Columbia agrees with the NASA OIG's determination. However, Columbia wishes to clarify that during the course of the audit, Columbia ultimately located two (not four) computers and confirmed that the equipment is being used consistent with the requirements of the awards.

Improper Labor Expenses

"We found that a Columbia financial analyst had performed the duties of a NASA resource analyst – a function routinely performed by a NASA civil servant or NASA contractor given the sensitivity of tracking government funds and costs – resulting in \$168,013 in unallowable charges to NASA. Although we determined this employee provided needed support for GISS activities, we do not find this to be an allocable cost in accordance with 2 CFR Part 220 because the work was not done to support this agreement. In 2015, NASA completed a Federal resource analyst position for which this Columbia employee applied was judged the most qualified, and subsequently hired."

Columbia Response:

Columbia disagrees with the NASA OIG's determination. These charges were appropriately charged to the award with the knowledge and approval of the relevant GISS officials. According to GISS officials, the strategy to utilize a Columbia resource funded through the award and separately consolidate the positions and hire a NASA resource analyst was based on NASA GISS's inability to hire a civil servant at the time. The Director of NASA GISS made the determination to consolidate the positions and received approval through the appropriate NASA channels to ensure that all conflict of interest and other regulatory controls were in place.

Summary

Columbia management wants to express its gratitude for the patience and professionalism shown by the NASA OIG audit team. Columbia management is committed to enhancing the supporting infrastructure and oversight of employees embedded in the GISS structure so as to partner in the continued growth and mission of the NASA GISS program. To that end, meetings have been held led by leadership of the Columbia Earth Institute and the Columbia School of Engineering, both of whom have PIs who hold GISS cooperative agreements.

Sincerely,



Barbara Hough
Vice President, Controller and Treasurer

APPENDIX G: REPORT DISTRIBUTION

National Aeronautics and Space Administration

Acting Administrator
 Acting Deputy Administrator
 Acting Associate Administrator
 Chief of Staff

Non-NASA Organizations and Individuals

Office of Management and Budget
 Deputy Associate Director, Energy and Space Programs Division
 Government Accountability Office
 Director, Office of Acquisition and Sourcing Management
 Columbia University
 Deputy Controller

Congressional Committees and Subcommittees, Chairman and Ranking Member

Senate Committee on Appropriations
 Subcommittee on Commerce, Justice, Science, and Related Agencies
 Senate Committee on Commerce, Science, and Transportation
 Subcommittee on Space, Science, and Competitiveness
 Senate Committee on Homeland Security and Governmental Affairs
 House Committee on Appropriations
 Subcommittee on Commerce, Justice, Science, and Related Agencies
 House Committee on Oversight and Government Reform
 Subcommittee on Government Operations
 House Committee on Science, Space, and Technology
 Subcommittee on Oversight
 Subcommittee on Space

(Assignment No. A-17-015-00)