DIRECTORATE FOR GEOSCIENCES (GEO) $1,393,860,000
+$72,720,000 / 5.5%

GEO Funding
(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request	Change Over FY 2012 Enacted Amount	Change Over FY 2012 Enacted Percent
Atmospheric & Geospace Sciences (AGS)	$258.65	$258.66	$266.61	$7.95	3.1%
Earth Sciences (EAR)	183.43	183.50	191.20	7.70	4.2%
Integrative & Collaborative Education & Research (ICER)	91.30	91.21	93.71	2.50	2.7%
Ocean Sciences (OCE)	351.79	351.90	377.44	25.54	7.3%
Polar Programs (PLR)	436.20	435.87	464.90	29.03	6.7%
U.S. Antarctic Logistical Support	[67.52]	[67.52]	[67.52]	-	-
Total, GEO	**$1,321.37**	**$1,321.14**	**$1,393.86**	**$72.72**	**5.5%**

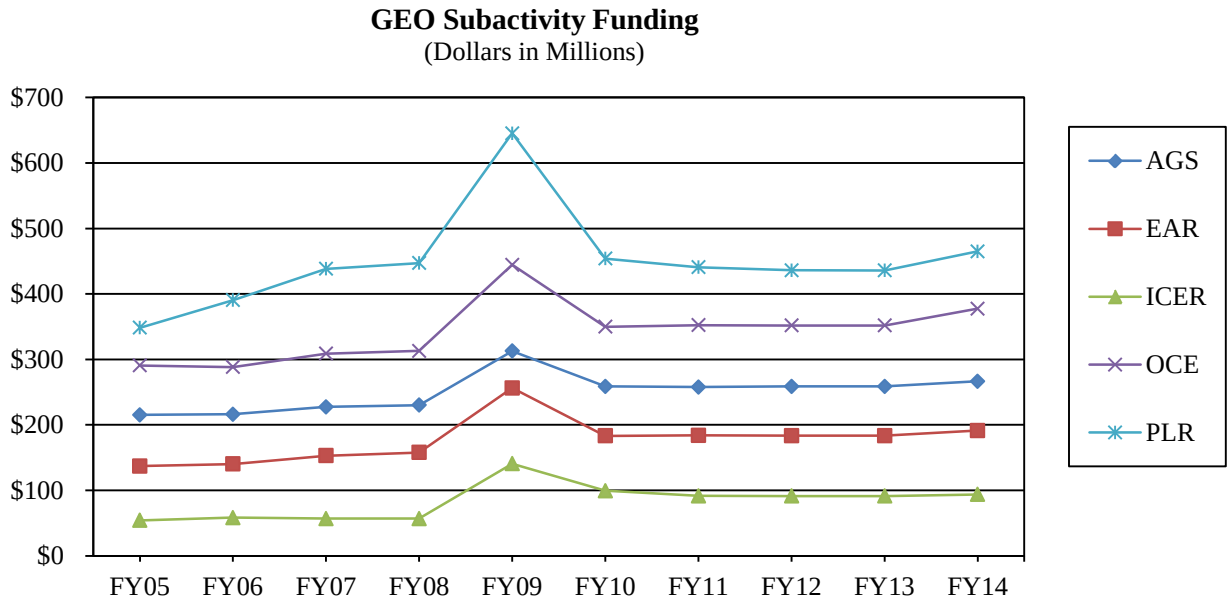
Totals may not add due to rounding.

About GEO

GEO supports basic research that advances the frontiers of knowledge and drives technological innovation while improving our understanding of the many processes that affect the global environment. These processes include the role of the atmosphere and oceans in climate, the planetary water cycle, and ocean acidification. Support is provided for interdisciplinary studies that contribute directly to national research priorities such as: understanding, adapting to, and mitigating the impacts of global change; developing and deploying integrated ocean observing capabilities to support ecosystem-based management; and understanding future availability of fresh water. Lives are saved and property is preserved through better prediction and understanding of natural environmental hazards, such as earthquakes, tornados, hurricanes, tsunamis, drought, and solar storms. Basic research supported by GEO enables preparation for and subsequent mitigation of, or adaptation to, the effects of these and other disruptive natural events.

GEO supports research spanning the Atmospheric, Earth, Ocean, and Polar sciences. As the primary U.S. supporter of fundamental research in the polar regions, GEO provides interagency leadership for U.S. polar activities. In the Arctic, NSF helps coordinate research planning as directed by the Arctic Research Policy Act of 1984. The NSF Director chairs the Interagency Arctic Research Policy Committee created for this purpose, which is now a component of the President's National Science and Technology Council. In the Antarctic, per Presidential Memorandum 6646, GEO manages all U.S. activities as a single, integrated program, making Antarctic research possible for scientists supported by NSF and by other U.S. agencies. The latter include the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), the U.S. Geological Survey (USGS), the Smithsonian Institution, and the Department of Energy. The U.S. Antarctic Program research activity supported by NSF also supports leadership by the U.S. Department of State in the governance of the continent and Southern Ocean under the aegis of the Antarctic Treaty.

GEO provides about 61 percent of the federal funding for basic research at academic institutions in the geosciences.



Note: FY 2009 includes ARRA funding. U.S. Antarctic Logistical Support is included in PLR funding data.

FY 2014 Summary by Division

- AGS's FY 2014 Budget Request is focused on enhancing support of the NSF-wide Science, Engineering, and Education for Sustainability (SEES) investment, maintaining support for disciplinary and interdisciplinary research activities, and support of the observational infrastructure required to conduct modern research, including overseeing operation of the NCAR-Wyoming supercomputer center.

- EAR's FY 2014 Budget Request is focused on enhancing support of the NSF-wide SEES investment, maintaining support for disciplinary and interdisciplinary research activities, and support of the observational infrastructure required to conduct modern research. A realignment of infrastructure support within EAR begins in FY 2013, and while overall support levels remain relatively steady, previously-existing facilities are being integrated into new activities.

- ICER's FY 2014 Budget Request will support emerging priority areas, such as Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21), while enhancing support of the NSF-wide SEES investment. Significant shifts in GEO's undergraduate education portfolio will occur, with investments moving toward the consolidated NSF-wide activity, Catalyzing Advances in Undergraduate STEM Education (CAUSE), which is led by the Directorate for Education and Human Resources.

- OCE's FY 2014 Budget Request will enhance support of the NSF-wide SEES investments where emphasis will be on understanding coastal systems and mitigating the impacts of disasters. OCE is strongly supporting the President's Executive Order establishing a National Ocean Policy (NOP) [1] through enablement of research, education, and infrastructure. OCE will continue to invest in research infrastructure, as well as develop and evaluate plans for potential new Regional Class

[1] www.whitehouse.gov/administration/eop/oceans/implementationplan

Research Vessels. Support for the Ocean Observatories Initiative (OOI) increases as operations ramp up.

- PLR's FY 2014 Budget Request is focused on maintaining strong disciplinary programs, targeted basic research in cross-foundation and interagency priorities, and supporting and improving the efficiency of critical facilities that enable research in both polar regions, most notably support for implementing recommendations of the U.S. Antarctic Program Blue Ribbon Panel (BRP).[2]

Major Investments

GEO Major Investments
(Dollars in Millions)

Area of Investment	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request	Change Over FY 2012 Enacted Amount	Change Over FY 2012 Enacted Percent
CAREER	$15.60	$13.08	$14.18	$1.10	8.4%
CIF21	4.49	8.00	16.50	8.50	106.3%
I-Corps	0.19	0.25	1.75	1.50	600.0%
INSPIRE	0.86	2.00	6.00	4.00	200.0%
SEES	58.75	58.75	86.27	27.52	46.8%

Major investments may have funding overlap and thus should not be summed.

- Faculty Early Career Development Program (CAREER): This Foundation-wide activity offers the National Science Foundation's most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education, and the integration of education and research within the context of the mission of their organizations. Approximately 30 awards will be made in FY 2014.

- CIF21: GEO support for the NSF-wide CIF21 investment ($16.50 million) will predominantly support development of EarthCube. A partnership with the Directorate for Computer and Information Science and Engineering (CISE), EarthCube seeks transformative concepts and approaches to create an integrated data management infrastructure across the geosciences. In addition, proposals submitted to CIF21 competitions will be considered for support along with other CIF21 activities across GEO.

- NSF Innovation Corps (I-Corps): GEO support of I-Corps gives project teams access to resources to help determine the readiness of technology developed by previously-funded or currently-funded NSF projects to transition from idea to product.

- Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE): Intended to encourage cross-disciplinary science, INSPIRE helps to break down disciplinary barriers and encourages program managers to use new tools, collaboration modes, and techniques in the merit-review process to widen the pool of prospective discoveries that may be hidden from or circumvented by traditional means. Leveraged by centralized support, scientists will utilize INSPIRE to pursue novel interdisciplinary research at the forefront of the geosciences.

[2] www.nsf.gov/od/opp/usap_special_review/usap_brp/rpt/index.jsp

- SEES: GEO supports a portfolio of activities that highlight NSF's unique role in helping society address the challenges of achieving sustainability. In FY 2014, existing areas, especially coastal and hazards-related research, will be strengthened and a thrust on sustainable materials will be supported by GEO.

GEO Funding for Centers Programs and Facilities

GEO Funding for Centers Programs
(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request	Change Over FY 2012 Enacted Amount	Change Over FY 2012 Enacted Percent
Centers Programs Total	**$17.66**	**$17.70**	**$16.11**	**-$1.59**	**-9.0%**
Nanoscale Science & Engineering Centers (ICER)	0.25	0.25	-	-0.25	-100.0%
Science & Technology Centers (AGS, OCE, PLR)	17.41	17.45	16.11	-1.34	-7.7%

Totals may not add due to rounding.

For detailed information on individual centers, please see the NSF-Wide Investments chapter.

- Nanoscale Science and Engineering Centers (NSEC): NSEC support will decrease by $250,000 as the award to the single center partially supported by GEO concludes.

- Science and Technology Centers (STCs): GEO supports a total of four Science and Technology Centers through funding from three divisions. FY 2014 completes the planned sunsetting of the Center for the Remote Sensing of Ice Sheets (CRESIS) as the center enters its final year of support.

GEO Funding for Facilities
(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request	Change Over FY 2012 Enacted Amount	Change Over FY 2012 Enacted Percent
Facilities Total	**$614.79**	**$591.53**	**$647.66**	**$56.13**	**9.5%**
Academic Research Fleet (OCE)	92.96	78.75	86.00	7.25	9.2%
Arctic Research Support & Logistics (PLR)	42.08	43.54	44.00	0.46	1.1%
Arecibo Observatory (AGS)	3.63	3.20	3.50	0.30	9.4%
Geodesy for the Advancement of Geoscience & EarthScope (EAR)	11.92	13.18	12.70	-0.48	-3.6%
IceCube Neutrino Observatory (PLR)	3.45	3.45	3.45	-	-
International Ocean Discovery Program (OCE)	51.68	44.40	50.00	5.60	12.6%
National Nanotechnology Infrastructure Network (ICER	0.60	0.60	0.30	-0.30	-50.0%
National Center for Atmospheric Research (AGS)	103.00	98.60	99.00	0.40	0.4%
Ocean Observatories Initiative (OCE)	26.80	26.80	52.80	26.00	97.0%
Seismological Facilities for the Advancement of Geosciences & EarthScope (EAR)	26.12	26.76	25.70	-1.06	-4.0%
U.S. Antarctic Facilities & Logistics (PLR)	185.02	184.73	202.69	17.96	9.7%
U.S. Antarctic Logistical Support (PLR)	67.52	67.52	67.52	-	-

Totals may not add due to rounding.

For detailed information on individual facilities, please see the Facilities chapter.

GEO has increased operations and maintenance budgets for facilities in order to provide the infrastructure needed by the broad geoscience research community and address BRP recommendations related to Antarctic infrastructure. Notable items include:

- Support for the Academic Research Fleet increase reflects the start of operation of the R/V *SIKULIAQ* and increased fuel costs.
- The International Ocean Discovery program funds increase enables a longer operational schedule for the vessel.
- Operational support for the Ocean Observatories Initiative (OOI) increases as the observatory procures spare parts and operations ramp up.
- U.S. Antarctic Facilities and Logistics, responding to BRP recommendations, will provide a significant increase to improve operational efficiency, reduce future operations costs, and increase safety of researchers and contractors working in Antarctica.

Summary and Funding Profile

In FY 2014, the number of research grant proposals is expected to be about 5,000 and GEO expects to award about 1,400 research grants. Average annual award size and duration are not expected to materially fluctuate in FY 2012 through FY 2014.

Operations and maintenance (O&M) funding for GEO-supported user facilities totals $646.36 million, and comprises 46 percent of GEO's FY 2014 Request. GEO has increased operations budgets for facilities to maintain current operational capacity, keep pace with needed increases for OOI O&M, and respond to BRP recommendations to increase efficiency of activities in Antarctica.

GEO Funding Profile

	FY 2012 Actual Estimate	FY 2012 Enacted/ Annualized FY 2013 CR Estimate[1]	FY 2014 Estimate
Statistics for Competitive Awards:			
Number of Proposals	5,246	5,774	5,500
Number of New Awards	1,640	1,788	1,700
Funding Rate	31%	31%	31%
Statistics for Research Grants:			
Number of Research Grant Proposals	4,716	5,140	5,000
Number of Research Grants	1,361	1,560	1,400
Funding Rate	29%	30%	28%
Median Annualized Award Size	$129,866	$132,750	$136,000
Average Annualized Award Size	$170,566	$167,867	$171,000
Average Award Duration, in years	2.6	2.8	2.8

[1] Award estimates shown for FY 2013, such as numbers of awards and size/duration, are based upon the FY 2012 Enacted level.

Program Monitoring and Evaluation

External Program Evaluations and Studies:

- In FY 2012, NSF and the Office of Science and Technology Policy received the report of the U.S. Antarctic Blue Ribbon Panel, *More and Better Science in Antarctica Through Increased Logistical Effectiveness*.[3] The FY 2014 Request allocates funding to begin implementing the recommendations of this group.
- Two reports from the National Research Council were received in 2012: *New Research Opportunities in the Earth Sciences*,[4] which identifies emerging research directions for consideration by NSF; and *Challenges and Opportunities in Hydrologic Sciences*,[5] which highlights research opportunities to help us better understand the role of water in the Earth system.

Workshops and Reports:

- Many workshops are convened each year to allow the research communities supported by GEO to articulate priorities. Of particular note in 2012 was an opportunity for considerable community planning around GEO's EarthCube activity. This ambitious program seeks to develop the cyberinfrastructure to knit together geoscience data from a variety of disciplines, and is GEO's contribution to NSF's CIF21 investment, and is central to GEO's strategy to capitalize on Big Data.

Committees of Visitors (COV):

- In 2012, COVs reviewed the NCAR and Facilities Section within AGS,[6] and Ocean Research and Education programs in OCE.[7] The COVs' reports were presented to the GEO Advisory Committee, which convened in April and October of 2012.
- In 2014, COVs will be held to review the Atmosphere Section within AGS and Instrumentation and Facilities programs in EAR.

The Performance chapter provides details regarding the periodic reviews of programs and portfolios of programs by external Committees of Visitors and directorate Advisory Committees. Please see this chapter for additional information.

Number of People Involved in GEO Activities

	FY 2012 Actual Estimate	FY 2013 Estimate	FY 2014 Estimate
Senior Researchers	6,924	7,700	7,300
Other Professionals	3,288	3,700	3,500
Postdoctorates	675	800	700
Graduate Students	2,947	3,100	3,100
Undergraduate Students	2,531	2,300	2,700
Total Number of People	**16,364**	**17,600**	**17,300**

[3] www.nsf.gov/od/opp/usap_special_review/usap_brp/rpt/index.jsp
[4] www.nap.edu/catalog.php?record_id=13236
[5] www.nap.edu/catalog.php?record_id=13293
[6] www.nsf.gov/geo/adgeo/advcomm/fy2012_cov/ags-geo-ncar-facilities-report-2012.pdf
[7] www.nsf.gov/geo/adgeo/advcomm/fy2012_cov/oce-geo-ocean-sciences-edu-report-2012.pdf

DIVISION OF ATMOSPHERIC AND GEOSPACE SCIENCES (AGS) — $266,610,000 +$7,950,000 / 3.1%

AGS Funding

(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request	Change Over FY 2012 Enacted Amount	Change Over FY 2012 Enacted Percent
Total, AGS	**$258.65**	**$258.66**	**$266.61**	**$7.95**	**3.1%**
Research	**121.11**	**124.28**	**139.65**	**15.37**	**12.4%**
CAREER	6.45	5.48	5.90	0.42	7.7%
Centers Funding (total)	4.00	4.00	4.00	-	-
STC: Multi-Scale Modeling of Atmospheric Processes	4.00	4.00	4.00	-	-
Education	**3.78**	**1.96**	**1.70**	**-0.26**	**-13.3%**
Infrastructure	**133.76**	**132.42**	**125.26**	**-7.16**	**-5.4%**
Arecibo Observatory	3.63	3.20	3.50	0.30	9.4%
National Center for Atmospheric Research (NCAR)	103.00	98.60	99.00	0.40	0.4%
Research Resources	27.13	30.62	22.76	-7.86	-25.7%

Totals may not add due to rounding.

The mission of AGS is to extend the intellectual frontiers in atmospheric and geospace sciences by making investments in fundamental research, technology development, and education that enable discoveries, nurture a vibrant, diverse scientific workforce, and help attain a prosperous and sustainable future. AGS supports activities to further our understanding of the physics, chemistry, and dynamics of Earth's atmosphere, from the Earth's surface to the Sun, on timescales ranging from minutes to millennia. AGS provides support for: 1) basic science projects and 2) the acquisition, maintenance, and operation of observational and cyberinfrastructure facilities and services that enable modern-day atmospheric and geospace science research activities. Although the majority of AGS support is through individual investigator merit-reviewed multi-year grants, the division also supports small-scale, limited-duration exploratory research projects; collaborative or multi-investigator group projects focusing on a particular problem, subject, or activity; large center or center-like projects; and funding for the research conducted at facilities provided by the NSF-supported National Center for Atmospheric Research (NCAR), which extends and enhances research at universities. More information on NCAR is available in the Facilities chapter. The division will increase support in key areas of fundamental atmospheric and geospace science, including dynamics and predictability of high-impact atmospheric and space weather hazards, and support for research concerning the complex and dynamic interactions among natural and human-driven processes in coastal areas through its contributions to NSF's Science, Engineering, and Education for Sustainability (SEES) activities of Hazards SEES and Coastal SEES.

Recognizing the close interplay between the division's support for science and the provision of facilities to support that science, AGS seeks a balance between its support for science and facilities. Approximately 50 percent of the annual budget of AGS is used to support observational and computational facilities, as well as the Arecibo Observatory and the Federally Funded Research and Development Center, NCAR. The Arecibo Observatory is also supported by Division of Astronomical Sciences in the Directorate for Mathematical and Physical Sciences. The remaining 50 percent of the

AGS budget is for individual, small group, and center-like research grants. In general, of the 50 percent of the AGS budget available for research grants, about 50 percent (or 25 percent of the total AGS portfolio) is available for new research grants; the remaining 50 percent funds continuing grants made in previous years.

FY 2014 Summary

All funding decreases/increases represent change over the FY 2012 Enacted level.

Research

- Support for early-career researchers is an AGS priority. The division increases its support for CAREER grants by $420,000 to a total of $5.90 million.
- The Space Weather Research program supports the development of integrative space science models, extending network observing capabilities, with the goal of meeting societal needs for improved monitoring and advancement of predictions of space weather phenomena and effects. Support for this program is increased by $1.0 million, to a total of $7.23 million.
- In FY 2014 AGS will contribute $19.40 million in support of the cross-directorate research opportunities within the Science, Engineering, and Education for Sustainability (SEES) portfolio. AGS will support Hazards SEES at $5.40 million and Coastal SEES at $3.0 million. For AGS, the overarching goal of Hazards SEES is to catalyze basic research in hazard-related science to support a broad spectrum of research into the improved understanding and prediction of atmospheric and space weather hazards. Among the goals of Coastal SEES are enabling place-based, system-level understanding of vulnerable coastal systems; yielding outcomes with quantitative predictive value; and identifying pathways to enhance coastal resilience. AGS support of SEES activities Decadal and Regional Climate Prediction using Earth System Models (EaSM) will continue at $10.0 million, while support for Water Sustainability and Climate will be supported at a level of $1.0 million.
- The Center for Multi-scale Modeling of Atmospheric Processes, an NSF Science and Technology Center (STC) initiated in FY 2006, will be maintained at $4.0 million.

Education

- AGS funding for the Research Experiences for Undergraduates (REU) Sites and Supplements program decreases $250,000 below the FY 2012 Enacted level to $1.0 million, reflecting increased support for CAREER. $180,000 of FY 2014 funding will support enhanced research experiences for students in their first two years of college, as recommended by the President's Council of Advisors on Science and Technology (PCAST) in their report, *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics*.
- AGS supports other education activities including AGS Postdoctoral Fellows. The total AGS education portfolio is $1.70 million in FY 2014.

Infrastructure

- Funding for the Arecibo Observatory will increase to $3.50 million (+$300,000).
- Support for the National Center for Atmospheric Research (NCAR) is increased by $400,000, to a total of $99.0 million. This level of support maintains key community research infrastructure operated by NCAR.
- Support for Research Resources is reduced by $7.86 million, to a total of $22.76 million. This level of support represents an increased focus on research using existing instrumentation rather than instrumentation development.

DIVISION OF EARTH SCIENCES (EAR)

$191,200,000
+$7,700,000 / 4.2%

EAR Funding
(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request	Change Over FY 2012 Enacted Amount	Change Over FY 2012 Enacted Percent
Total, EAR	**$183.43**	**$183.50**	**$191.20**	**$7.70**	**4.2%**
Research	**119.45**	**117.09**	**125.75**	**8.66**	**7.4%**
CAREER	6.18	4.80	5.07	0.27	5.6%
Education	**4.42**	**4.93**	**5.48**	**0.55**	**11.2%**
Infrastructure	**59.57**	**61.48**	**59.97**	**-1.51**	**-2.5%**
Geodesy for the Advancement of Geoscience & EarthScope (GAGE)	11.92	13.18	12.70	-0.48	-3.6%
Seismological Facilities for the Advancement of Geosciences & EarthScope (SAGE)	26.12	26.76	25.70	-1.06	-4.0%
Research Resources	21.54	21.54	21.57	0.03	0.1%

Totals may not add due to rounding.

EAR supports fundamental research into the structure, composition, and evolution of the Earth, and the life it has sustained over the four and a half billion years of Earth history. The results of this research will lead to a better understanding of Earth's changing environment (past, present, and future); the natural distribution of its mineral, water, biota, and energy resources; and provide methods for predicting and mitigating the effects of geologic hazards, such as earthquakes, volcanic eruptions, floods, and landslides.

Through its Surface Earth Processes Section, EAR supports research in geomorphology and land use, hydrologic science, geobiology and low temperature geochemistry, and sedimentary geology and paleobiology. The division's Deep Earth Processes Section maintains programs in geophysics, tectonics, petrology and geochemistry, and integrated earth systems. In addition to these fundamental research programs, EAR has an Instrumentation and Facilities program that supports community-based, shared-use facilities; and the acquisition and development of instrumentation by individual investigators; EarthScope, a $200.0 million facility and science program focused on studying the structure and tectonics of the North American continent; and an education program that funds a number of activities to attract and support students and young investigators to the field of Earth Science.

Approximately 68 percent of EAR's budget is used to support individuals and small groups of researchers, while about 32 percent of the budget goes to instrumentation and facilities. In general, 36 percent of EAR's portfolio is available for new research grants. The remaining 64 percent funds continuing grants made in previous years.

FY 2014 Summary

All funding decreases/increases represent change over the FY 2012 Enacted level.

Research

- EAR will continue its participation in SEES with $8.90 million for Water Sustainability and Climate, an increase of $1.90 million. In FY 2014, EAR will also participate in SEES SusCHEM - Sustainable Chemistry, Engineering, and Materials at $1.50 million, Hazards SEES at $4.50 million, and Coastal SEES at $3.50 million.
- In FY 2014 EAR's support for NSF's INSPIRE Track 1 investment will be $1.0 million.
- CAREER funding will be increased by $270,000 to a total of $5.07 million, reflecting EAR's continued commitment to supporting early career investigators.

Education

- EAR funding for the Research Experiences for Undergraduates (REU) Sites and Supplements program increases $250,000 over the FY 2012 Enacted level to $1.34 million. $180,000 of the increased FY 2014 funding will support enhanced research experiences for students in their first two years of college, as recommended by the President's Council of Advisors on Science and Technology (PCAST) in their report, *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics.*
- Support for EAR Postdoctoral Fellowships will increase by $300,000 to $1.70 million reflecting EAR's commitment to workforce development.

Infrastructure

- Beginning in FY 2014, the separate seismic and geodetic facilities operated by the Incorporated Research Institutions for Seismology (IRIS), UNAVCO and EarthScope will be integrated into two facilities: (1) Seismological Facilities for the Advancement of Geosciences and EarthScope (SAGE), operated by IRIS, will be funded at $25.70 million; and (2) Geodetic Facilities for the Advancement of Geoscience and EarthScope (GAGE), operated by UNAVCO, will be funded at $12.70 million.

DIVISION OF INTEGRATIVE AND COLLABORATIVE EDUCATION AND RESEARCH (ICER)

$93,710,000
+$2,500,000 / 2.7%

ICER Funding
(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request	Change Over FY 2012 Enacted Amount	Change Over FY 2012 Enacted Percent
Total, ICER	**$91.30**	**$91.21**	**$93.71**	**$2.50**	**2.7%**
Research	**60.91**	**72.04**	**77.35**	**5.31**	**7.4%**
Centers Funding (total)	0.25	0.25	-	-0.25	-100.0%
Nanoscale Science & Engineering Centers	0.25	0.25	-	-0.25	-100.0%
Education	**29.79**	**18.57**	**16.06**	**-2.51**	**-13.5%**
Infrastructure	**0.60**	**0.60**	**0.30**	**-0.30**	**-50.0%**
National Nanotechnology Infrastructure Network (NNIN)	0.60	0.60	0.30	-0.30	-50.0%

Totals may not add due to rounding.

ICER supports novel, complex, or partnership projects in both research and education. These investments cut across traditional boundaries within the geosciences, encouraging interdisciplinary activities and responding directly to critical needs of the entire geoscience community. ICER's principal goals are to develop innovative means to initiate and support geoscience education, attract underrepresented groups to careers in the geosciences, foster the interchange of scientific information nationally and internationally, and to join with other parts of NSF in major integrative research and education efforts. In FY 2014, the division will make strategic investments in climate research, international activities, education, diversity, and human resource development.

In general, 38 percent of the ICER portfolio is available for new research grants. The remaining 62 percent funds continuing grants made in previous years.

FY 2014 Summary

All funding decreases/increases represent change over the FY 2012 Enacted level.

Research

- ICER will support SEES activities totaling $17.25 million in FY 2014. Supported activities will lay the foundation for technologies to mitigate, and adapt to, environmental change that threatens sustainability, with an emphasis in FY 2014 on vulnerable regions in the Arctic and along coasts. ICER will participate in activities to establish a robust suite of Sustainability Research Networks, and in a program to identify clean energy sources and the impact of using those sources on the environment and society.
- ICER supports a varied portfolio of international collaborative activities. In FY 2014, this will total $6.50 million, and emphasize collaborative research across the Americas and specific research activities sponsored by the International Group of Funding Agencies for Global Change Research.

Education

- In FY 2014, GEO is consolidating geoscience education and diversity support into the NSF-wide CAUSE initiative. ICER houses GEO's support for the CAUSE activity, which totals $10.90 million in FY 2014. No other education efforts are supported by ICER in FY 2014.

Infrastructure

- ICER provides GEO's contribution to the National Nanotechnology Infrastructure Network. In FY 2014, this support decreases by $300,000, to a total of $300,000, as a previously supported center refocuses its emphasis upon renewal.

DIVISION OF OCEAN SCIENCES (OCE) $377,440,000
+$25,540,000 / 7.3%

OCE Funding

(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request	Change Over FY 2012 Enacted Amount	Change Over FY 2012 Enacted Percent
Total, OCE	**$351.79**	**$351.90**	**$377.44**	**$25.54**	**7.3%**
Research	**162.47**	**183.21**	**175.69**	**-7.52**	**-4.1%**
CAREER	1.64	2.80	3.21	0.41	14.6%
Centers Funding (total)	8.96	9.00	9.00	-	-
STC: Coastal Margin Observation & Prediction	4.00	4.00	4.00	-	-
STC: Dark Energy Biosphere Investigations	4.96	5.00	5.00	-	-
Education	**9.00**	**7.94**	**6.12**	**-1.82**	**-22.9%**
Infrastructure	**180.32**	**160.75**	**195.63**	**34.88**	**21.7%**
Academic Research Fleet	92.96	76.75	85.00	8.25	10.7%
International Ocean Discovery Program (IODP)	51.68	44.40	50.00	5.60	12.6%
Ocean Observatories Initiative (OOI)	26.80	26.80	52.80	26.00	97.0%
Research Resources	8.87	10.80	6.83	-3.97	-36.8%
Facilities Pre-Construction Planning (total)	-	2.00	1.00	-1.00	-50.0%
Regional Class Research Vessels (RCRV)	-	2.00	1.00	-1.00	-50.0%

Totals may not add due to rounding.

Research, education, and infrastructure funded by OCE address the central role of the oceans in a changing Earth and as a national strategic resource, as recognized in the President's 2010 Executive Order establishing a National Ocean Policy (NOP) and creating a National Ocean Council (NOC) to implement the policy. OCE supports interdisciplinary research to better understand changing ocean circulation and other physical parameters, biodiversity and the dynamics of marine organisms and ecosystems, and changing ocean chemistry as exemplified by ocean acidification. OCE also supports research on the geology of the ocean margins and sub-seafloor to investigate past ocean and climate conditions, stability of methane hydrates, natural hazards associated with earthquakes and volcanic eruptions, and microbial life deep below the seafloor. Ocean education emphasizes undergraduate REU programs and the interdisciplinary nature of ocean sciences. Since ocean science requires access to the sea, OCE supports research vessels, deep submergence capability including submersibles and autonomous vehicles, and technologically advanced sensors and instrumentation. In FY 2014, research emphases in OCE will be guided by the recently issued report "*Science for an Ocean Nation: An Update of the Ocean Research Priorities Plan*".[8] This report identifies national research priorities in key areas of interaction between society and the ocean. These priorities include improved understanding of marine ecosystems, marine biodiversity, the impact of increased atmospheric carbon dioxide on ocean acidification, the

[8] www.whitehouse.gov/sites/default/files/microsites/ostp/ocean_research_plan_2013.pdf

ocean's role in climate change, ocean observing, changing conditions in the Arctic, hazards and extreme events, and the enhancement of infrastructure to support ocean and coastal research.

In general, 30 percent of the OCE portfolio is available for new research grants. The remaining 70 percent funds continuing grants made in previous years. Approximately 52 percent of the overall budget supports facilities and infrastructure.

FY 2014 Summary

Research

- OCE's research funding decreases by $7.52 million from the FY 2012 Enacted level, primarily due to increased infrastructure funding. Included here are a $2.0 million investment in INSPIRE and a $1.60 million increase in CAREER. OCE will continue support for two STCs and the Long Term Ecological Research program at previous levels. OCE will give high priority to research themes that emerge from both the NOP and the Ocean Research Priorities Plan.
- OCE will invest $19.50 million in SEES activities. This includes $8.50 million in Coastal SEES, $2.50 million in Hazards SEES, $6.0 million in Ocean Acidification, and $2.50 million in Dimensions of Biodiversity.
- OCE will also continue its partnership on the theme of Oceans and Human Health with the National Institute of Environmental Health Sciences (NIEHS).

Education

- Funding for educational activities will decrease by $1.82 million, reflecting the close-out of the Centers for Ocean Science Education Excellence (COSEE) program during FY 2014.
- OCE support for REU will increase by $1.12 million over the FY 2012 Enacted level. $220,000 of the increased FY 2014 funding will support enhanced research experiences for students in their first two years of college, as recommended by the President's Council of Advisors on Science and Technology (PCAST) in their report, *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics*.
- Funding will continue for a program initiated in FY 2012, the OCE Postdoctoral Fellowship Program. This program aims to broaden participation in the ocean sciences through fellowships to enhance opportunities for women and minority scientists.

Infrastructure

- Continuation of investment ($1.0 million) in planning and design for fleet renewal with construction of up to three Regional Class Research Vessels (RCRVs), as a candidate Major Research Equipment and Facilities Construction (MREFC) project.
- A $26.0 million increase for continued implementation of the Ocean Observatories Initiative (OOI), bringing the total for operations and maintenance to $52.80 million in FY 2014. These increased funds support the transition from the design/build phase to deployment and testing of the network leading to full commissioning and operation in FY 2015.
- Continued support ($50.0 million) is requested for FY 2014 operations of the drilling vessel, *JOIDES Resolution* as part of the U.S. contribution to the International Ocean Discovery Program (IODP). This level is $5.60 million above the FY 2012 Enacted level. In FY 2012, the National Science Board approved a one-year extension of the current program into FY 2014 to allow time for a competition, currently underway, to award a new cooperative agreement to continue operations of the *JOIDES Resolution*. In FY 2013, NSF investments in IODP have been leveraged by support from international partners and allowing sub-leasing of the vessel to industry by the current contractor. Such leveraging is expected to continue in FY 2014 and beyond.
- The cost of Academic Research Fleet operations will increase, reflecting the general upward trend in fuel costs and other expenses.

DIVISION OF POLAR PROGRAMS (PLR) $464,900,000
+$29,030,000 / 6.7%

PLR Funding
(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request	Change Over FY 2012 Enacted Amount	Change Over FY 2012 Enacted Percent
Total, PLR	**$436.20**	**$435.87**	**$464.90**	**$29.03**	**6.7%**
Research	**129.36**	**127.71**	**139.34**	**11.63**	**9.1%**
CAREER	1.34	-	-	-	N/A
Centers Funding (total)	4.45	3.77	3.11	-0.66	-17.5%
STC: Center for Remote Sensing of Ice Sheets	4.45	3.77	3.11	-0.66	-17.5%
Education	**2.45**	**2.55**	**0.80**	**-1.75**	**-68.6%**
Infrastructure	**304.39**	**305.61**	**324.76**	**19.15**	**6.3%**
Arctic Research Support & Logistics	42.08	43.54	44.00	0.46	1.1%
IceCube Neutrino Observatory (IceCube)	3.45	3.45	3.45	-	-
U.S. Antarctic Facilities & Logistics	185.02	184.73	202.69	17.96	9.7%
U.S. Antarctic Logistical Support	67.52	67.52	67.52	-	-
Polar Environment, Safety, and Health	6.31	6.37	7.10	0.73	11.5%

Totals may not add due to rounding.

The Division of Polar Programs (PLR) is the primary U.S. supporter of, and serves NSF interagency leadership responsibilities for, fundamental research in the polar regions. The Arctic Sciences section supports research in social, earth systems, and a broad range of natural sciences; its Research Support & Logistics program is driven by and responds to research by assisting researchers with access to the Arctic and for engagement in planning and sharing of results with local Arctic communities. Antarctic Sciences funds research for which access to Antarctica is essential to advancing the scientific frontiers, including research in a broad array of geo- and bio-sciences, such as earth system science, as well as space and astrophysical sciences that can only be achieved or are best achieved with work performed in Antarctica and the Southern Ocean. Antarctic Infrastructure and Logistics enables research in Antarctica on behalf of the U.S. Government through a network of stations, labs, equipment, and logistical resources. The Environment, Safety, and Health section provides oversight for the environmental, safety, and health aspects of research and operations conducted in polar regions.

PLR's FY 2014 Request reflects three key priorities: (1) maintaining strong disciplinary programs that provide a base for investments in cross-disciplinary science programs; (2) focusing basic research on cross-foundation (e.g., Science, Engineering, and Education for Sustainability (SEES), Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21), GEOTRACES), and interagency priorities; and (3) supporting and improving the efficiency of critical facilities that enable research in both polar regions. For Antarctica, the primary objective is to initiate a concerted multi-year commitment toward more effective and lower-cost science support as recommended by the U.S. Antarctic Program (USAP) Blue Ribbon Panel (BRP) report, *More and Better Science in Antarctica through Increased Logistical Effectiveness*.[9] NSF issued a formal response to this report in

[9] www.nsf.gov/od/opp/usap_special_review/usap_brp/rpt/index.jsp

March 2013.[10] This entails coordinated commitments by the Antarctic Sciences and Antarctic Infrastructure and Logistics sections, as well as the Environment, Safety, and Health section. Emphases include safety and health improvements, investments with positive net present value, and facilities renewal at McMurdo and Palmer stations. Additionally, the Antarctic science community will be asked to plan and execute more effective observational approaches as outlined in the 2011 National Research Council (NRC) report, *Future Science Opportunities in Antarctica and the Southern Ocean*,[11] and reaffirmed by the BRP. For the Arctic, shared cross-directorate basic research objectives, the recently released Interagency Arctic Research Policy Committee's (IARPC) *Arctic Research Plan FY 2013-2017* (Five-Year Plan)[12] and the *National Ocean Policy (NOP) Implementation Strategy*[13] inform science investment priorities.

In general, 40 percent of the PLR research portfolio is available for new grants and 60 percent for continuing grants. Approximately 70 percent of the overall budget supports facilities and logistics.

FY 2014 Summary

All funding decreases/increases represent change over the FY 2012 Enacted level.

Research

- Funding increases to develop mechanisms to coordinate with Alaska Native organizations to build partnerships and broaden participation in scientific research, and to strengthen PLR's long-standing commitment to engaging Alaska Native students and communities. (+$200,000, to a total of $300,000)
- PLR will collaborate with OCE to support the U.S. components of several marine expeditions under the GEOTRACES program to measure trace elements and isotopes across the Arctic Ocean and the connecting passages between the Arctic, Atlantic, and Pacific Oceans. (+$2.0 million, to a total of $2.0 million)
- Core Arctic research will be prioritized to support reinvestment in sustained synthesis of modeling and observational data at the system level and for research on the Chukchi and Beaufort Seas, also taking an integrative system-level approach. These will complement the more focused research supported by mission agencies, such as the Bureau of Ocean Energy Management (BOEM) and the National Oceanic and Atmospheric Administration (NOAA), and contribute to the coordinated activity under IARPC. ($6.0 million)
- Core Antarctic research investments will include prioritizing investments in remotely deployed observation instruments and improved climate modeling techniques and capabilities, as recommended in the NRC and BRP reports. ($4.0 million)
- Funding for the Center for the Remote Sensing of Ice Sheets (CReSIS) (-$660,000, to a total $3.11 million) reflects the planned sunsetting of the center in FY 2015.

Education

- Funding for the Research Experiences for Undergraduates (REU) Sites and Supplements program increases $300,000 over the FY 2012 Enacted level. The increased funding will support enhanced research experiences for students in their first two years of college, as recommended by the President's Council of Advisors on Science and Technology (PCAST) in their report, *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics.*

[10] www.nsf.gov/news/news_summ.jsp?cntn_id=127345&org=NSF&from=news
[11] www.nap.edu/catalog.php?record_id=13169
[12] www.nsf.gov/od/opp/arctic/iarpc/arc_res_plan_index.jsp
[13] www.whitehouse.gov/administration/eop/oceans/implementationplan

Infrastructure

- Arctic Research Support and Logistics: The Arctic Research Support and Logistics program provides support for Arctic researchers, including airplanes, helicopters, access to icebreakers and field camps for researchers participating in approximately 150 projects in remote sites in Alaska, Canada, Arctic Scandinavia, Russia, and the Arctic Ocean. Summit Station on the Greenland icecap operates as a year-round international site for a variety of atmospheric and geophysical measurements. Increased funding will support anticipated ship-time on the new UNOLS vessel *SIKULIAQ*. (+$460,000, to a total of $460,000)
- IceCube Neutrino Observatory: PLR continues to match the Directorate for Mathematical and Physical Science's contribution of $3.45 million for operations and maintenance of the IceCube Observatory.
- U.S. Antarctic Facilities and Logistics:
  - Funding provides all necessary infrastructure, instrumentation, and logistics for scientists from all disciplines performing research in Antarctica. This support includes forward staging facilities in New Zealand and South America; operation of three year-round stations in Antarctica; DoD fixed-wing aircraft, contracted rotary- and fixed-wing aircraft; two leased research vessels, and a leased icebreaker.
  - The NSF FY 2014 Budget Request for Antarctic Facilities and Logistics also focuses on implementing recommendations from the USAP BRP. NSF issued a formal response to the BRP in March 2013,[14] and this Budget Request incorporates investments outlined in that document, totaling $18.0 million. These include:
    - Address resupply issues at Palmer Station by improving the condition of the pier and mitigating the underwater rock ledge that currently prevents larger vessels from docking at the station ($8.0 million). The small boating range will also be increased through the purchase of rigid hull inflatable boats ($1.0 million), which will allow for better access to areas of scientific interest and provide a more robust platform for the recovery of remote sensing systems, such as gliders and robotic underwater vehicles;
    - Improve fire suppression engineering through a study of fire suppression requirements and existing capabilities in order to target any areas needing improvement ($1.0 million);
    - Roboticize the overland traverse to increase productivity by increasing the number of trips each swing of the traverse can make in a single season to the South Pole or other interior scientific locations ($2.0 million). New tractors will be purchased for the heavy traverse ($4.0 million) to provide a standardized tractor fleet on which to build the robotics system; and
    - Consolidate warehousing activities to enable reductions in physical and personnel footprint. The first phase of the new McMurdo long-range plan involves construction of a single logistics and warehousing facility, as well as a consolidated trade shop and warehousing complex. Design work will begin on these facilities so that materials and equipment can be purchased for delivery to Antarctica on the 2015 resupply vessel. ($2.00 million)
- Polar Environment, Safety, and Health: The Environment, Safety, and Health section provides oversight for these aspects of conducting and supporting research in the polar regions. Funds are invested in development of an electronic medical records system that will serve both polar regions. (+$180,000 to a total of $180,000)

[14] www.nsf.gov/news/news_summ.jsp?cntn_id=127345&org=NSF&from=news