

## GEOSCIENCES

**\$909,000,000**  
**+\$101,870,000 / 12.6%**

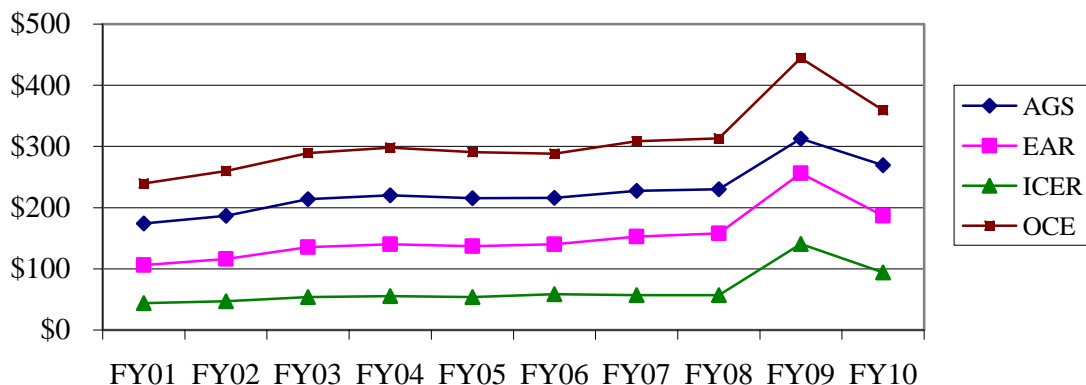
### Geosciences Funding (Dollars in Millions)

	FY 2008 Actual	FY 2009		FY 2010 Request	Change Over FY 2009 Plan	
		Current Plan	FY 2009 ARRA Estimate		Amount	Percent
Atmospheric and Geospace Sciences (AGS)	\$230.03	\$244.60	\$68.20	\$269.16	\$24.56	10.0%
Earth Sciences (EAR)	157.82	171.00	85.22	186.85	15.85	9.3%
Integrative & Collaborative Education and Research (ICER)	56.96	61.17	79.58	93.92	32.75	53.5%
Ocean Sciences (OCE)	313.06	330.36	114.00	359.07	28.71	8.7%
<b>Total, GEO</b>	<b>\$757.87</b>	<b>\$807.13</b>	<b>\$347.00</b>	<b>\$909.00</b>	<b>\$101.87</b>	<b>12.6%</b>
Major Components:						
Research and Education Grants	\$713.24	\$769.77	\$274.15	\$874.82	\$105.05	13.6%
Instrumentation	52.87	67.76	10.32	79.48	11.72	17.3%
Centers Programs	18.56	18.26	-	13.79	-4.47	-24.5%
Facilities O&M	255.05	299.32	62.53	282.30	-17.02	N/A

Totals may not add due to rounding.

As the principal source of federal funding for university-based fundamental research in the geosciences, the Directorate for Geosciences addresses the Nation's need to understand, predict, and respond to environmental events and changes. GEO-supported research also advances our ability to predict natural phenomena of economic and human significance, such as climate changes, hurricanes, and earthquakes.

### GEO Subactivity Funding (Dollars in Millions)



### GEO in Context

GEO provides about 63 percent of the total federal funding for university-based, basic research in the geosciences. In addition to playing a critical role in addressing the Nation's need to understand, predict, and respond to environmental events and changes, GEO also helps to determine the best use of Earth's resources. Fundamental research in the geosciences advances scientific knowledge of resources such as fresh water, energy, minerals, and biological diversity, leading to improved future quality of life. GEO investments include many environmental studies coordinated through the U.S. Climate Change Science Program.

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: hydrologic systems, biogeochemical dynamics, ecological systems and dynamics, solid earth processes, and solar influences on the Earth system. 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.

Key investments in FY 2010 are focused on NSF's Climate Research program and complementary efforts to develop America's workforce by providing graduate research fellowships and promoting education related to climate change.

The FY 2010 Request for GEO includes \$8.0 million to leverage activities across the directorate aimed at increasing support for transformative research, including highly innovative research and education projects across the entire range of Geoscience interests. Special attention will be paid to challenges associated with prediction and adaptation to regional climate change and broadening the participation of investigators and institutions in the scientific enterprise. GEO will also utilize NSF's innovative processes for identifying potentially transformative research, such as special competitions and increased use of specialized funding mechanisms, notably NSF's EAGER (EARly-concept Grants for Exploratory Research) grants.

### **Directorate-wide Changes and Priorities**

#### *Climate Research (\$46.0 million, new in FY 2010).*

In FY 2010, GEO will make a major investment in NSF's new climate change research effort. The major themes under consideration for the program are: forecasting thresholds in environmental changes; balancing the carbon budget; expanding observational and modeling capabilities for water, ice, and ecosystems; understanding the impact of ocean acidification, and developing new energy-efficient computing and networking capabilities and other infrastructure for climate research. The long-term goal of this program is to assert U.S. leadership in understanding the causes and consequences of climate change and develop effective strategies to respond to it.

#### *GEO/EHR Collaboration (\$6.0 million, new in FY 2010).*

Recognizing the strengths of each organization's programs and communities, in FY 2010 GEO and EHR will initiate a set of collaborative activities intended to broaden participation in the geosciences and to enhance education about and understanding of the geosciences among both students and the broader public.

#### *CAREER (+\$1.69 million, to a total of \$12.22 million).*

The CAREER program supports preeminent young geoscientists, and is a key mechanism for jump-starting junior faculty toward independent careers in research and education. GEO CAREER awardees not only undertake exciting potentially transformative research, but also seek to engage the next generation of citizens and scientists in innovative new ways.

*Climate Change Education (\$1.50 million, new in FY 2010).*

In partnership with EHR, BIO and OPP, GEO will support innovative formal and informal education activities centered on the general theme of climate science.

*Graduate Research Fellowships (\$1.0 million, new in FY 2010).*

To promote the education and participation in the research enterprise of the next generation of geoscientists, GEO is contributing to the NSF-wide Graduate Research Fellowship program. This investment will support fellowships for about 9 high-quality students who would otherwise not receive support.

**Program Evaluation and Performance Improvement**

The Performance Information chapter describes the Foundation’s performance evaluation framework, which is built upon the four strategic outcome goals in NSF’s Strategic Plan: *Discovery, Learning, Research Infrastructure, and Stewardship*. Performance evaluation is conducted at all levels within the Foundation, using both qualitative and quantitative measures – including an agency-wide annual review of research and education outcomes by an external expert committee and periodic reviews of programs and portfolios of programs by external Committees of Visitors and directorate Advisory Committees. Other performance indicators, such as funding rates, award size and duration, and numbers of people supported on research and education grants, are also factored into the performance assessment process. GEO has a contract for assessment of its cross-directorate education programs.

**Number of People Involved in GEO Activities**

	FY 2008 Estimate	FY 2009 Estimate	FY 2009	
			ARRA Estimate	FY 2010 Estimate
Senior Researchers	4,618	4,900	2,000	5,500
Other Professionals	2,801	3,000	1,200	3,300
Postdoctorates	562	600	200	700
Graduate Students	2,412	2,600	1,000	2,900
Undergraduate Students	1,658	1,800	700	2,000
<b>Total Number of People</b>	<b>12,051</b>	<b>12,900</b>	<b>5,100</b>	<b>14,400</b>

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**GEO Funding Profile**

	FY 2008	FY 2009	FY 2010
	Estimate	Estimate	Estimate
<b>Statistics for Competitive Awards:</b>			
Number of Proposals	4,241	4,700	4,500
Number of New Awards	1,333	1,750	1,500
Regular Appropriation	1,333	1,300	1,500
ARRA	-	450	-
Funding Rate	31%	37%	33%
<b>Statistics for Research Grants:</b>			
Number of Research Grant Proposals	3,696	4,100	4,000
Number of Research Grants	1,059	1,400	1,200
Regular Appropriation	1,059	1,000	1,200
ARRA	-	400	-
Funding Rate	29%	34%	30%
Median Annualized Award Size	\$118,339	\$125,000	\$130,000
Average Annualized Award Size	\$149,626	\$160,000	\$170,000
Average Award Duration, in years	2.8	3.0	3.0

**Recent Research Highlights**

► **Unmanned Aerial Vehicles Identify Pollution's Role in Asian Warming Trends:** A researcher from the University of California at San Diego has discovered that pollution-filled "brown clouds" over southern Asia are playing a significant role in regional climate change. It was thought the net effect of radiation absorbed and scattered by these pollutant aerosols would be to cool Earth's surface. Instead, instrumented unmanned aerial vehicles sent over the Indian Ocean determined the local effects of the particles released from industrial and vehicle emissions and burning biomass were capable of enhancing solar heating in the lower atmosphere by 50 percent. When the effects of pollution are inserted into a climate model, the results match well with observations, especially from higher elevations such as the rapidly warming Himalayan mountain region. This research shows that on a regional scale in one of the most polluted areas on Earth, the net effect of pollutants is on the same scale as greenhouse gases.



A New Observing System:  
Autonomous Unmanned Aerial Vehicles (UAVs)  
Ramanathan, Roberts, Nguyen, Raman & Corrigan, 2006

Autonomous Unmanned Aerial Vehicles (UAVs) flown in the field experiment. The image is a montage, as the actual vertical separation of the UAVs was a much larger distance. *Credit: Dr. V. Ramanathan.*

► **First-Ever Global Map of Human Influence on the Marine Ecosystem:** More than 40 percent of the world's oceans are affected heavily by human activities according to the first ever global scale study of anthropogenic impact on marine ecosystems.



Coral reef ecosystem. Credit: Joseph Pawlik (UNCW).

NSF-funded researchers overlaid maps of 17 different factors of human activity, such as fishing, pollution, and commercial shipping, to produce a composite map of the toll that humans have exacted on the oceans. They also included effects of anthropogenic climate change such as ocean acidification, increased ultraviolet radiation, and ocean temperature in the study. They found that no region is unaffected by human activity but that large regions with relatively little human impact remain, particularly near the poles. They also found that different ecosystems were affected differently. Hard- and soft-bottom continental shelves and rocky reefs have the highest predicted cumulative impact scores while open oceans and deep waters have the lowest.

► **Cultivating the Next Generation of Computer Scientists:** To tackle complex, real-life problems such as climate change we need sophisticated computing and data systems and the people who run them. Currently, the United States faces a shortage of scientists and engineers trained to use and maintain high-performance computer and data systems. The National Center for Atmospheric Research and its Computing and Information Systems Laboratory are striving to make inroads into this issue. In 2007, the lab launched its Summer Internships in Parallel Computational Science, which allows students to gain practical experience with a wide variety of parallel computational science problems. They work with the high-performance computing systems on applications relevant to the center's earth science mission, while being mentored by computational experts. Seven interns from Colorado, North Carolina, and Wyoming universities participated this year.



Students who took part in Summer Internships in Parallel Computational Science. From left to right are Ryan O. Kuinghttons, Colorado School of Mines; Victor Snyder, Colorado School of Mines; Kenny Gruchalla, Univ. of Colorado; Michael Levy, Univ. of Colorado; Arunasalam Rahuynanthan, Univ. of Wyoming; Matthew Norman, North Carolina State Univ.; Robert House, Univ. of Colorado. Credit: UCAR.

► **Students Explore the Indian Ocean through Virtual Expedition:** In 2007, researchers aboard the R/V *Roger Revelle* explored a unique 2,800-mile-long volcanic ridge in the Indian Ocean called the NinetyEast Ridge. Students from the U.S. and around the world joined the researchers at sea virtually, using Web-based activities and videoconferencing. Students actively tracked the expedition, studied photos of dredged rocks, responded to weekly science assignments from the shipboard scientists, and helped name newly discovered seamounts. Participation grew throughout the expedition and has continued to grow as results from shore-based work became available on the website. The interaction of scientists and students in real time on a research expedition is an example of education outreach that broadens participation from under-represented groups and diverse institutions from a wide array of schools nationally and internationally.



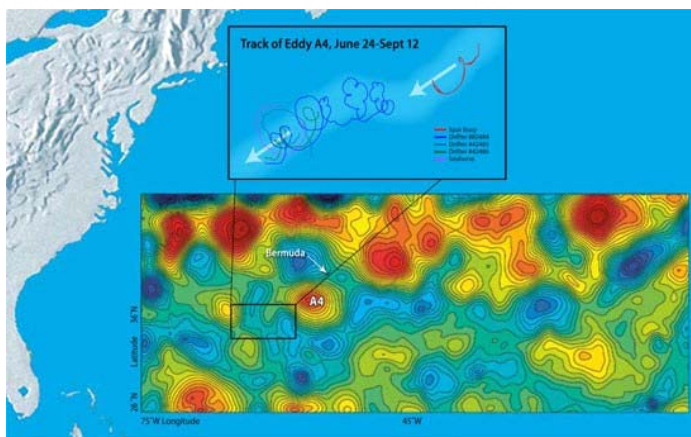
Scientists gather around the rock dredge to look at the rocks brought up from the seafloor on board the R/V *Roger Revelle*. Credit: William Sager.

► **Will There Be an Increase in Severe Thunderstorms Due to Climate Change?:** A recent Purdue University study used global and high-resolution regional climate models to examine large-scale meteorological conditions that foster severe weather formation in the United States. The researchers determined that in the late 21st Century, due to climate change, there likely will be an increase in the number of days in which severe thunderstorms occur. Climate models cannot currently simulate phenomena as small as thunderstorms, but they can simulate the larger-scale distributions of temperature, moisture, and winds that influence severe convective storms. In a scenario with increased temperatures from greenhouse emissions, there was growth in convective available potential energy and a decrease in wind shear, both of which are factors for severe storms. The largest future increases are projected to be during the summer, especially in the southern and eastern United States.



A severe thunderstorm that occurred on June 7, 2005, near Murdo, S.D.  
Credit: Karen A. Kosiba. Photo courtesy of the Trapp research group.

► **Wind Influences Biological Productivity of Ocean Eddies:** Researchers repeatedly sampled 10 different ocean eddies in the northern Atlantic Ocean. They found when wind interacted with eddies rotating clockwise, cold, nutrient-rich water swelled up from below the surface and continually moved surface water away from the center of the eddy. The result was sustained biological productivity at the surface and thriving phytoplankton and zooplankton communities below the surface. In contrast, productivity as a result of wind interacting with eddies rotating counterclockwise lasted only a short time due to a reverse effect. These results point to the need to include explicit representations of eddy and wind interactions in ocean and climate models. The Woods Hole Oceanographic Institution, Rutgers University, Bermuda Institute of Ocean Sciences, Virginia Institute for Marine Sciences, National Oceanography Center in the UK, Humboldt State University, the University of California at Santa Barbara and the University of Miami took part in this study.



Data from satellite altimeters (lower inset), which measure sea surface heights, show depressions (blue) and bumps (red) that mark cold- and warm-water eddies in the ocean on June 17, 2005. Researchers tracked the southwestward motion of eddy A4 (light-blue in the upper inset) by ship from June 24 to Sept. 12. They released several drifters and a buoy (colored tracks) to capture the swirling motion of the eddy's currents. *Credit: This figure was drafted by Jim Canavan and provided as a courtesy by Dennis McGillicuddy, WHOI, and the Colorado Center for Astrodynamic Research.*

► **Observations from the Critical Zone:** Scientists refer to the region between the top of the forest canopy and the base of our living environment as the critical zone. To understand the critical zone's response to climatic and land-use forces, NSF initiated observatories in the watersheds of the Sierra Nevada, the Front Range of the Colorado Rockies, and the Appalachian Uplands. The respective site managers are the University of California, the University of Colorado at Boulder, and the Pennsylvania State University. Each observatory will investigate the integration and coupling of Earth surface processes as mediated by the presence and flux of fresh water. The three observatories will work together under the guidance of an independent science steering committee. The observatories will benefit the entire Earth surface science community by spurring more collaboration and linking individual research to big questions.



Schematic vision of a Critical Zone Observatory, showing part of the multiple sensor array that will be used to investigate the hydrological, geochemical, geobiological, and physical evolution of the critical zone. Methods brought to bear by multiple investigators and institutions will range from detailed field surveys to computationally intensive numerical modeling, from geophysical and geochemical investigations to networked cyberinfrastructure that will share and archive an unparalleled data type. *Credit: Roger Bales, UC Merced.*





**ATMOSPHERIC AND GEOSPACE SCIENCES**

**\$269,160,000**  
**+\$24,560,000 / 10.0%**

**Atmospheric and Geospace Sciences Funding**

(Dollars in Millions)

	FY 2008	FY 2009	FY 2009	FY 2010	Change Over	
	Actual	Current Plan	ARRA Estimate	Request	FY 2009 Plan Amount	Percent
<b>Total, AGS</b>	<b>\$230.03</b>	<b>\$244.60</b>	<b>\$68.20</b>	<b>\$269.16</b>	<b>\$24.56</b>	<b>10.0%</b>
Major Components:						
Research and Education Grants	\$220.01	\$234.60	\$55.00	\$259.36	\$24.76	10.6%
Instrumentation	29.62	29.62	-	31.00	1.38	4.7%
Centers	8.00	8.00	-	6.80	-1.20	-15.0%
<i>Science and Technology Centers</i>	8.00	8.00	-	6.80	-1.20	-15.0%
Facilities	91.09	108.92	13.20	103.00	-5.92	-5.4%
<i>National Astronomy and Ionosphere Center</i>	2.02	2.00	-	3.00	1.00	50.0%
<i>National Center for Atmospheric Research</i>	89.07	106.92	13.20	100.00	-6.92	-6.5%

**Summary of FY 2010 Request**

*Atmospheric and Geospace Science (AGS) (+\$24.56 million for a total of \$269.16 million in FY 2010).* AGS supports activities to further our understanding of the physics, chemistry, and dynamics of the 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 the traditional “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 project, subject, or activity; large center or center-like projects; and funding for the research conducted by NSF’s National Center for Atmospheric Research (NCAR), which extends and enhances research at universities. The division will increase support in key areas of atmospheric and geospace science such as climate research, space weather, and studies of the genesis and dynamics of storms. Approximately 46 percent of the annual budget of AGS is used to support individuals and small groups of researchers, with approximately 16 percent of the total division budget being available to support new research grants.

Key investments in FY 2010 include:

- \$12.0 million to support NSF’s new Climate Research activity, with emphasis on advanced computation and modeling of the dynamic climate system.
- \$100.0 million to support activities at the National Center for Atmospheric Research, including operation of an advanced supercomputer center and of research aircraft.
- A general emphasis on increasing award size and duration across the research portfolio.



**EARTH SCIENCES****\$186,850,000**  
**+\$15,850,000 / 9.3%****Earth Sciences Funding**

(Dollars in Millions)

	FY 2009	FY 2009	FY 2010	Change Over		
	FY 2008	Current		ARRA	FY 2009 Plan	FY 2009 Plan
	Actual	Plan	Estimate	Request	Amount	Percent
<b>Total, EAR</b>	<b>\$157.82</b>	<b>\$171.00</b>	<b>\$85.22</b>	<b>\$186.85</b>	<b>\$15.85</b>	<b>9.3%</b>
Major Components:						
Research and Education Grants	\$151.26	\$164.74	\$68.57	\$183.86	\$19.12	11.6%
Instrumentation	23.25	23.60	10.32	25.84	2.24	9.5%
Centers	6.56	6.26	-	2.99	-3.27	-52.2%
<i>Science and Technology Centers</i>	6.56	6.26	-	2.99	-3.27	-52.2%
Facilities	30.96	36.31	6.33	37.41	1.10	3.0%
<i>IRIS</i>	11.75	12.00	2.33	12.36	0.36	3.0%
<i>EarthScope</i>	19.21	24.31	4.00	25.05	0.74	3.0%

**Summary of FY 2010 Request**

*Earth Sciences (EAR)* (+\$15.85 million for a total of \$186.85 million in FY 2010). The Division of Earth Sciences supports activities to discover how the Earth functions as a complex system. Studies span topics including earthquakes and related tsunamis, volcanoes, the processes leading to formation of fossil fuels, and the hydrologic cycle which provides the clean water we require to sustain life. In FY 2010, EAR will focus on climate research, including past episodes of climate change, supporting operation and maintenance of the recently-completed EarthScope facility, and enhancing programs looking at dynamic Earth process. Approximately 65 percent of the annual budget of EAR is used to support individuals and small groups of researchers, with approximately 29 percent of the total division budget available to support new research grants.

Key investments in FY 2010 include:

- Funding for research and education grants in EAR will increase by \$11.57 million (10.7 percent) over FY 2009.
- EAR will contribute \$7.0 million to NSF's new Climate Research activity.
- \$35,000 will be added to CAREER awards bringing the total to \$4.30 million in FY 2010.
- Funding for the Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHRA) Science and Technology Center (STC) will end following 10 successful years of operation. EAR continues to support the National Center for Earth-surface Dynamics (NCED).
- EarthScope operations and maintenance costs will increase by 3 percent over the FY 2009 budget to \$25.05 million, providing for full operation of the EarthScope facility.



**INTEGRATIVE AND COLLABORATIVE  
EDUCATION AND RESEARCH**

**\$93,920,000**  
**+\$32,750,000 / 53.5%**

**Integrative & Collaborative Education and Research Funding**

(Dollars in Millions)

	FY 2008 Actual	FY 2009 Current Plan	FY 2009 ARRA Estimate	FY 2010 Request	Change Over FY 2009 Plan Amount	Percent
<b>Total, ICER</b>	<b>\$56.96</b>	<b>\$61.17</b>	<b>\$79.58</b>	<b>\$93.92</b>	<b>\$32.75</b>	<b>53.5%</b>
Major Components:						
Research and Education Grants	\$55.86	\$59.71	\$79.58	\$91.92	\$32.21	53.9%
Facilities	1.10	2.00	-	2.00	-	-
Ship Operations	1.10	2.00	-	2.00	-	-

**Summary of FY 2010 Request**

*Integrative and Collaborative Education and Research (ICER) (+32.75 million for a total of \$93.92 million in FY 2010).* 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 2010, the division will make strategic investments in climate research, high-risk/high-reward science, and education, diversity and human resource development. Over 90 percent of the annual budget of ICER is used to support individuals and small groups of researchers, with approximately 49 percent of the total division budget being available to support new research grants.

Key investments in FY 2010 include:

- \$15.0 million to launch a new program on climate research, which will target interdisciplinary areas of climate science, and advance our ability to predict and mitigate against future climate change.
- \$1.50 million to partner with EHR, BIO and OPP on a cross-Foundation climate science education activity. This program will support innovative education and public outreach activities to broaden understanding of climate change among students and the general public.
- \$1.0 million to support Graduate Research Fellowships. Initiated in FY 2009 with ARRA funds, this will enable additional fellowships to be granted to geoscience students.
- \$6.0 million to support a number of activities in partnership with the Education and Human Resources Directorate, in recognition of the strong potential to enhance diversity and education across the geosciences. Specific program plans are currently under development.
- \$8.0 million to leverage investments in highly innovative research and education projects across the entire range of Geoscience interests. Special attention will be paid to challenges associated with prediction and adaptation to regional climate change and broadening the participation of investigators and institutions in the scientific enterprise. Also of interest are projects that explore the interactions between society and the environment and understanding the processes associated with environmental hazards.



**OCEAN SCIENCES**

**\$359,070,000**  
**+\$28,710,000 / 8.7%**

**Ocean Sciences Funding**

(Dollars in Millions)

	FY 2008	FY 2009	FY 2009	FY 2010	Change Over	
		Current	ARRA		FY 2009 Plan	
	Actual	Plan	Estimate	Request	Amount	Percent
<b>Total, OCE</b>	<b>\$313.06</b>	<b>\$330.36</b>	<b>\$114.00</b>	<b>\$359.07</b>	<b>\$28.71</b>	<b>8.7%</b>
Major Components:						
Research and Education Grants	\$286.11	\$310.72	\$71.00	\$339.68	\$28.96	9.3%
Instrumentation	-	14.54	-	22.64	8.10	55.7%
Long-term Ecological Research Centers	3.74	3.64	-	4.49		
Centers	4.00	4.00	-	4.00	-	-
<i>Science and Technology Centers</i>	4.00	4.00		4.00	-	-
Facilities	131.90	154.09	43.00	141.89	-12.20	-7.9%
<i>Academic Research Fleet</i>	75.28	98.68	18.00	87.58	-11.10	-11.2%
<i>Integrated Ocean Drilling Program</i>	37.41	43.41	25.00	43.41		
<i>Ocean Observatories Initiative</i>	19.21	12.00	-	10.90	-1.10	-9.2%

**Summary of FY 2010 Request**

*Ocean Sciences (OCE)* (+28.71 million for a total of \$359.07 million in FY 2010). Research, education, and infrastructure funded by OCE address the central role of the oceans in a changing Earth and as a national strategic resource. OCE supports interdisciplinary research of the water column to better understand controls on natural processes such as CO<sub>2</sub> exchange between the oceans and atmosphere and implications for ocean acidification. OCE also supports research on the geology of the ocean margins and sub-seafloor to investigate past ocean and climate conditions, natural hazards associated with earthquakes and volcanic eruptions, and biological strategies used in the deep biosphere. Ocean education, formal and informal, draws on the interdisciplinary nature of ocean sciences, sophisticated visualization capabilities and the impact of the oceans on environmental change. Because 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 2010, OCE will emphasize research on climate change, including the impact of increased atmospheric CO<sub>2</sub> on ocean acidification, and operation and maintenance of infrastructure such as the academic research fleet and infrastructure associated with the Ocean Observatories Initiative. Approximately 34 percent of the OCE budget is available to support new research activities annually.

Key investments in FY 2010 include:

- OCE will contribute \$12.0 million to NSF's new Climate Research activity.
- \$10.90 million will support initial operation of the Ocean Observatories Initiative project, which is being constructed through the MREFC Account.
- \$87.58 million will support operation and upgrade of the Academic Research Fleet. Within this total, \$5.0 million will support the continuing construction of a new human occupied deep submergence vehicle, and \$2.0 million will support design work to enable possible future construction of new research vessels.

