

Earth Sciences in the FY 2001 Budget

David Applegate and Margaret Baker, AGI

HIGHLIGHTS

- **National Science Foundation (NSF):** Funding for the Geosciences Directorate would increase by 19.5 percent, and its Earth Sciences Division would see a 16.6 percent increase. In addition, \$17.4 million is requested in the Major Research Equipment budget for the Earthscope initiative, the first such request ever for the earth sciences.
- **U.S. Geological Survey (USGS):** The Survey as a whole would receive a 10 percent budget increase. Within that, the Geologic Division would receive a 6.4 percent increase, and the Water Resources Division's budget would rise 6.3 percent. Projects slated for new funding include upgrading the national seismic and streamgage networks and development of a digital geologic mapping database.
- **Department of Energy (DOE):** Geoscience research funding in the DOE Office of Science is slated for a 1.0 percent increase. Fossil Energy R&D would undergo a major shift away from upstream production-related research toward downstream technology development.
- **National Aeronautics and Space Administration (NASA):** Although the agency is slated for its first increase in years, the Earth Science Enterprise program—primarily focused on remote-sensing data interpretation in global change and hazards studies—would decline 2.6 percent.

INTRODUCTION

Table 1. Budget request for principal agencies and programs supporting earth-science R&D (budget authority in millions of dollars).

Agency/ Program	FY1999 enacted	FY2000 estimate	FY 2001 % request	% Change FY 00-01
Department of Energy				
Basic Energy Sciences				
Geosciences Research	24.2	21.8	22.0	1.0
Fossil Energy R&D				
Natural Gas Research	26.6	31.6	38.8	22.6
Petroleum Research	48.6	57.3	52.6	-8.2
Solar & Renewable Energy				
Geothermal	28.2	23.6	27.0	14.4
Yucca Mountain Site Characterization				
Core Science	74.8	70.6	69.4	-1.7
Department of the Interior				
U.S. Geological Survey*	797.2	813.4	895.4	10.1
Geologic Division* **	238.7	211.2	224.8	6.4
Water Resources Div.* **	209.4	185.8	197.6	6.3
NASA				
Earth Science Enterprise	1,413.8	1,443.4	1,405.8	-2.6
Earth Sci. Program Science***	251.8	286.3	353.2	23.4
EOS Science	46.4	60.3	59.2	-1.8
National Science Foundation				
Geosciences Directorate	478.0	487.8	583.0	19.5
Earth Sciences Division	98.9	101.7	118.5	16.6
Major Research Equip. -- EarthScope	--	--	17.0	--

Source: Agency budget materials, Office of Management and Budget.

* - Includes non-R&D components.

** - FY1999-FY2000 change includes funds transferred to new and expanded USGS-wide facilities, science support, and integrated science accounts.

*** - NASA has restructured the Research and Technology requirements within ESE to distinguish between the research and applications programs.

A wide variety of federal agencies fund earth scientists to conduct research, carry out assessments, and collect data relevant to environmental, natural resource, natural hazards, and science policy mandates. When one focuses more narrowly on earth science research and development (R&D), the lion's share is carried out in four federal

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agencies and departments: the Department of Energy (DOE), the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the U.S. Geological Survey (USGS) within the Department of the Interior.

Funding for core earth science programs in these agencies has been flat or declining in recent years. New funds requested in the President's budgets have generally been targeted to specific initiatives tied to Administration goals, and these in turn have regularly run counter to congressional views of proper agency direction. The result has been that neither core programs nor new initiatives have met with particular success.

This year, the President's proposed budgets for both NSF and USGS represent the largest dollar increases in the history of these agencies. Just as significantly, the funding increases would be directed at both new initiatives and core programs. In contrast, funding for most earth science R&D programs at DOE and NASA shows a decline in support from last year. Table 1 provides an overview of the President's FY 2001 budget request for earth-science R&D in these four agencies and departments. Readers who seek to view earth-science research in a broader context are encouraged to examine the previous chapter in this report (Chapter 17) covering atmospheric and ocean sciences as well as the chapters on agency R&D budgets.

DEPARTMENT OF ENERGY (DOE)

Fossil Energy R&D: A majority of the geoscience research funded through the Office of Fossil Energy is related to petroleum exploration and production. Funds that previously supported these areas of research have been redirected to provide for a large increase in natural gas infrastructure reliability. A 22.6 percent increase in Natural Gas R&D is offset by a 8.2 percent decrease in Petroleum R&D. The bulk of Petroleum Exploration and Production funds are directed at programs to keep endangered oil fields in operation and to encourage domestic producers to share effective management practices that increase production.

Basic Energy Sciences: The Geosciences Research program within DOE Basic Energy Sciences is slated for a slight increase after receiving a 9 percent cut in FY 2000. This program provides peer-reviewed grants to universities and DOE national laboratories for fundamental geoscience research in geochemistry, hydrology, rock mechanics, and geophysical imaging—areas with broad application to multiple DOE mission areas including oil and gas exploration and development, geothermal energy, and environmental remediation. Funding for the Climate Change Technology Initiative within Geosciences Research would maintain its \$6.8 million budget, which includes a carbon sequestration program.

Geothermal: The geothermal research program within the Solar and Renewable Energy account funds earth-science research in materials, geofluids, geochemistry, geophysics, rock properties, reservoir modeling, and seismic mapping. GeoPowering the West, a new initiative for this fiscal year, is slated to bring a \$2.0 million increase to the geothermal program, but only a fraction of these funds will go directly to R&D. The majority of geothermal research is hosted under the Geoscience and Supporting Technologies division, which is requesting \$11.0 million, an 8.7 percent decrease.

Yucca Mountain Site Characterization: This project to study the viability of the Yucca Mountain site in Nevada for the world's first high-level nuclear waste repository remains a fertile program for earth-science research, especially because of conflicting viability assessment reports and recommendations. Most of the research for the site viability occurs in the Core Science subdivision, which funds investigations of models and the physical setting of the site. This year, the Core Science program is slated for a 1.7 percent decrease to a total of \$69.4 million.

U.S. GEOLOGICAL SURVEY (USGS)

When USGS Director Charles “Chip” Groat introduced the Survey’s FY 2001 budget request, he emphasized that the bulk of the requested 10 percent increase was focused on core activities. All four of the USGS divisions are slated to receive increases, the largest going to the National Mapping Division (up 22.5 percent) and Biological Resources Division (up 16 percent). The Geologic Division would receive a 6.4 percent increase, including new funds to develop real-time warning capabilities for

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the national earthquake monitoring network (\$2.6 million) and for volcano monitoring in Alaska (\$0.5 million). An increase of \$7.5 million is requested for expanding digital geologic map capabilities through grants to state geological surveys. These increases are offset by decreases to remove several congressionally earmarked projects and a \$2.5 million cut to coal availability and recoverability studies.

The Water Resources Division would receive a 6.3 percent increase, including \$4 million to upgrade the national streamgage network. Other increases include \$2 million to improve state and local communities' access to water information, \$2.7 million to provide predictive modeling tools and decision support information for natural resource managers, and \$3.3 million to provide science support for other Interior Department bureaus. To offset those increases, the hydrologic research program would receive a \$2.5 million cut, and water data collection and management projects would be cut by \$2.8 million.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA's Earth Science Enterprise (ESE) supports Earth systems science, an interdisciplinary research field that looks at the oceans, land surface, atmosphere, and biota as dynamically related components of the Earth system. Many of the ESE programs are interagency research projects primarily related to remote-sensing data interpretation in global change and hazards studies. Science research to support the Earth Observing System (EOS), the major element of ESE, would receive a decrease of \$2.8 million or 5.4 percent. The major solid-earth science research program at NASA is the Solid Earth and Natural Hazards program—only the Solid Earth section is defined as research because the Natural Hazards projects work to bring scientific knowledge into practical use. Research in crustal strain, time-varying gravity modeling, and interior and crustal dynamics and developing, analyzing, and documenting multi-year data sets that began in the past year will continue under the Solid Earth program. NASA estimates that close to 1,160 earth-science research activities will be supported in the coming year with an average duration of 3 years.

NATIONAL SCIENCE FOUNDATION (NSF)

In constant dollars, funding for the NSF Geosciences Directorate (GEO) has been virtually flat for the past decade, a trend even more pronounced for the Directorate's Earth Sciences Division (EAR). Two years ago, EAR received a 4.2 percent increase and last year received a 2.8 percent increase. In that context, the President's request of a 16.6 percent increase is striking.

Across the GEO Directorate, approximately two-thirds of the request for new funding is tied to foundation-wide initiatives: Biocomplexity in the Environment (\$39.5 million in new money), Information Technology Research (\$16.6 million in new funds), Nanoscale Science and Engineering (\$7.8 million in new funds), and 21st Century Workforce (\$0.4 million in new funds). Except for the last one, GEO was not included in any of these initiatives last year.

For the first time ever, a Major Research Equipment request has been made for an earth science project—the Earthscope initiative. The request for \$17.4 million in FY 2001 would initiate the first two components of Earthscope: the USArray seismic network and the San Andreas Fault Observatory at Depth (SAFOD). USArray consists of a dense array of high-capability seismometers deployed in a step-wise fashion across the United States. The seismic deployment will be accompanied by geologic, geochronologic, geochemical, and related research to provide a complete picture of the structure and evolution of the North American continent. SAFOD is an instrumented borehole through the San Andreas fault, for the first time allowing scientists to directly observe the physical and chemical processes controlling earthquake generation within a major, active fault zone. The two remaining components of Earthscope, the Plate Boundary Observatory and the satellite-based Interferometric Synthetic Aperture Radar mission, are still in the planning stages.

The Earthscope request effectively doubles the EAR budget increase. In addition, a significant amount of the research funded by NSF's Office of Polar Programs is in the earth sciences. The President has requested a 17 percent increase in the US Polar Research budget to \$222.8 million.