

## Atmospheric and Ocean Sciences in the FY 2001 Budget

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### HIGHLIGHTS

- Budgets for some of the key atmospheric and ocean sciences funding agencies are slated for increases. The National Science Foundation's (NSF) request would result in a 17.3 percent increase and the National Oceanic and Atmospheric Administration's (NOAA) a 20 percent increase. The National Aeronautics and Space Administration's (NASA) overall budget would increase by 3.2 percent, while Space Science would increase by 9.4 percent and Earth Science would decrease by 2.6 percent. The Department of Energy's (DOE) Biological and Environmental Research (BER) account would increase by 3 percent.
- The Administration's commitment to ocean research and protection would continue with NOAA's National Ocean Service (NOS) requesting a 79 percent increase and NSF's Ocean Sciences Division requesting a 22 percent increase.
- Environmental satellites would continue to provide data to study the Earth's climate system. Aqua (formerly PM-1) would be launched as well as several approved Earth Probes.
- As Solar Maximum approaches (CY 2000-2002), NASA has proposed a \$500 million multi-year program called "Living With a Star" that would develop and launch scientific and operational spacecraft to examine the Earth-Sun connection. Other agency efforts within the National Space Weather Program would

enhance a basic research competition (Department of Defense (DOD) and NSF), create a Community Coordinated Modeling Center for space weather modeling (DOD, NASA, NOAA, and NSF), and enhance communications between scientists and users of space weather information (NASA, NOAA, and NSF).

- The tri-agency (DOD, NASA, and NOAA) National Polar Orbiting Environmental Satellite System (NPOESS) program, converging the civil and military operational polar satellite systems into a single program jointly with the European program, remains on track with plans for technology transfer from NASA to the operational program.
- Programs combating global warming would be augmented by \$721 million for a total of \$2.4 billion, and consolidated into a climate package. Research on climate change and its likely consequences (the U.S. Global Change Research Program (USGCRP)) would receive \$1.7 billion, an increase of \$39 million.

## **INTRODUCTION AND POLITICAL ENVIRONMENT**

Atmospheric and Ocean Sciences are an integral part of the Earth system. Research in these two areas provides information on the constituency of these two media, how they change in time and space, where they move, and how they affect the Earth system. They are interdisciplinary, as illustrated by research on the role of carbon in the environment.

Neither the atmosphere nor the oceans know national boundaries, so they are international by their very nature. Effects of the El Niño of 1997-1998 and its successor, the La Niña of 1999-2000, influenced life around the Earth. The assessment of impacts by research groups led to good long-term guidance and will develop into operational climate forecasting. In the short term, there were significant successes including the forecasting of Hurricane Floyd, but there were shortcomings in the forecasts of some major winter storms in Europe and the U.S.

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Collection and analyses of data are necessary to understand the environment. Free and open exchange of global data is required for research, operations, and education. Activities in these disciplines often have impact on societal issues and extend across governmental jurisdictions, both national and international. Atmospheric scientists study droughts, storms, and floods while ocean scientists study floods, tsunamis, sea level change, storm tides, and fisheries. Support for such activities is found in more than one agency.

The roots of USGCRP and all climate-related programs are found in the atmospheric and ocean sciences. The assessment component interacts with societal issues. USGCRP depends highly on data collection and analyses, computer modeling, and the advancement of those technologies as well as an integration of many sciences into a systems approach.

#### **NATIONAL SCIENCE FOUNDATION (NSF)**

NSF's \$4.6 billion budget would represent a 17.3 percent increase of \$675 million (see Table II-7). Research and Related Activities would increase 19.7 percent (from \$3.0 billion to \$3.5 billion). Education and Human Resources would increase 5.5 percent (from \$691 million to \$729 million). Major Research Equipment would increase 48.2 percent (from \$94 million to \$139 million). Information Technology Research (\$327 million) and Biocomplexity in the Environment (\$136 million) would provide additional resources for the atmospheric and ocean sciences.

NSF's Geosciences Directorate would receive a 19.5 percent increase for a total of \$583 million that would enhance support for the U.S. Weather Research Program, National Space Weather Program, U.S. Global Change Research Program, and research on key physical, chemical, and geologic cycles within the Earth System. Atmospheric Sciences would increase by 17.7 percent to \$194 million. Ocean Sciences would increase by 22.2 percent to \$270 million. The National Center for Atmospheric Research would receive \$76 million, an increase of \$7 million, for continued research activities and for building upgrades. The Academic Research Fleet would receive \$44 million and the Ocean Drilling Program \$54 million, an increase of \$7 million for technical support and scientific studies of Earth system history, continental margins, and the deep biosphere.

U.S. Polar Research Programs would receive a 17.0 percent increase (to \$223 million) to provide interdisciplinary studies of the Arctic System and research on Antarctic ice sheets and oceans. Emphasis would be on increased access to both Polar Regions through improvements in weather forecasting and air navigation systems. Modernization of South Pole Station would be provided through the Major Research Equipment account.

#### **NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)**

The agency's budget request of \$2.9 billion represents an increase of \$500 million. NOAA continues to play a key role in several administration initiatives. Funding for the National Disaster Reduction Initiative would increase by \$110 million primarily in the National Weather Service (NWS), National Environmental Satellite, Data and Information Services (NESDIS), and an interagency integrated Global Disaster Information Network. This initiative is aimed primarily at reducing threats from severe weather, floods and droughts. The Lands Legacy Initiative would add \$266 million to preserve U.S. coasts and oceans. America's Ocean Future Initiative would increase by \$52 million for navigation, fisheries and fleet replacement. The Climate Observation and Services Initiative would increase by \$28 million for a climate reference network, improved availability of climate data and observing systems.

The Office of Oceanic and Atmospheric Research (OAR) would increase from \$306 million to \$319 million to include climate observations and services, a transition from research to operational forecasts. The NWS budget would increase by \$53 million to \$710 million, much of which would support local warnings and forecasts. NPOESS would receive \$77 million, an increase of \$17 million. The geostationary satellite (GOES) budget would increase by \$25 million to \$290 million. The NOS would receive a major increase of \$228 million in the ocean and coastal related initiatives.

#### **NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)**

NASA's budget would increase 3.2 percent to \$14.0 billion, the first real increase in seven years (see Table II-12). Space Science would increase by 9.4 percent from \$2.2 billion to \$2.4 billion. A \$500 million new

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program, Living with a Star, would receive \$20 million initial funding to study solar variability and solar weather and their effects on the Earth.

Earth Science would decrease 2.6 percent to \$1.4 billion. In the newly structured Earth Science budget, Earth Probes would drop sharply. The Ozone Mapping Spectrometer, Triana, and the Earth System Science Pathfinder probe missions are currently approved. The Earth Observing System (EOS) would increase from \$286 million to \$353 million with most of the increase going to mission science teams. The spacecraft program would decrease from \$501 million to \$447 million. The EOS Aqua and Chemistry-1 missions remain on track for launches in 2000 and 2001. Funding for EOS Data Information System (EOSDIS) would drop from \$262 million to \$252 million. Earth Science education would decrease from \$12 million to \$4 million.

#### **OTHER AGENCIES**

DOE's Office of Science would receive a 12 percent increase to \$3.15 billion. The largest increase would be to Advanced Scientific Computing Research, up 42 percent to \$182 million. Biological and Environmental Research (BER) would increase 3 percent to \$445.3 million.

R&D in the Army and Air Force would decrease, and the Navy's "6.1" category (basic research) would increase by 6.2 percent. Total Defense Research Sciences would increase by 5.7 percent. University Research Initiatives would increase by 17.6 percent to \$263 million.

The Environmental Protection Agency's (EPA) request would provide \$215 million to support partnerships to improve air quality nationwide and \$227 million for the Climate Change Technology Initiative (CCTI) to promote innovative technologies and reduce pollution. EPA would allocate \$455 million toward attaining national standards for ozone and particulate matters and \$133 million to reduce toxic emissions.

#### **CLIMATE CHANGE RELATED PROGRAMS**

The budget proposes \$2.4 billion, an increase of \$721 million, for programs aimed directly at combating global warming. Table 1 provides

budget requests for the components of the program. These actions include programs that previously were components of the CCTI.

**Table 1.** Budget request for climate-related domestic programs  
(budget authority in millions of dollars)

Climate Change Programs	FY 2000 Enacted	FY 2001 Request	Change FY 00-01
International Clean Energy for 21st Century	98	201	+103
Biofuels/Bioproducts Research Initiative	196	289	+93
Clean Air Partnership Fund	0	85	+85
CCTI - tax incentives	--	201	+201
CCTI - spending	1,099	1,432	+333
Other Climate-Related Investments	413	424	+9
<b>TOTAL</b>	<b>1,721</b>	<b>2,442</b>	<b>+721</b>

The International Clean Energy Initiative would encourage open competitive markets and remove market barriers to clean energy technologies in developing and transition countries, and would provide new incentives for clean energy technology innovation and export.

The Bioenergy and Bioproducts Initiative would accelerate the development and use of bio-based technologies that convert crops, trees, and other “biomass” into fuels, power, chemicals, and other products.

The Clean Air Partnership would provide grants to states, localities, and tribes to support efforts that achieve reductions in both greenhouse gas emissions and ground-level air pollution.

CCTI tax incentives over the next five years would help reduce greenhouse gas emissions by spurring the purchase of energy efficient products and the use of renewable energy. This would apply to homes and buildings, vehicles, clean energy, and industry.

CCTI proposes spending for the research, development, and deployment of renewable energy technologies, energy efficient products, and energy efficient buildings that would help reduce U.S. greenhouse gas emissions.

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This would cover the four major carbon-emitting sectors of the economy—buildings, transportation, industry, and electricity.

Other climate-related investments would contribute to improving energy efficiency and reducing greenhouse gas emissions. This would include an aggressive R&D effort to develop next-generation technologies for the combustion and use of coal and natural gas, facilitate energy efficiency investments at the State and local level, and reduce carbon emissions resulting from agriculture and forestry and enhance the ability of “sinks,” such as forests and farmlands, to sequester or store carbon.

#### **U.S. GLOBAL CHANGE RESEARCH PROGRAM (USGCRP)**

The USGCRP is an interagency, National Research Program under the auspices of the National Science and Technology Council’s (NSTC) Committee on Environment and Natural Resources. It began as a Presidential Initiative and was codified by the Global Change Research Act of 1990. Its fundamental purpose is to increase understanding of the Earth system and thus provide a sound scientific basis for national and international decision making on global change issues. It seeks to provide a sound scientific understanding of both the human and natural forces that influence the Earth’s climate system.

The FY 2001 budget proposes \$1.7 billion, an increase of \$39 million (see Table I-10 for funding details by agency). The program is divided into a space-based observation component (52 percent of the program) that would receive a decrease of \$34 million due to the phasing out of funding for large development projects. Scientific research and surface-based monitoring would receive an increase of \$79 million. The research component consists of seven elements—understanding the Earth’s climate system, composition and chemistry of the atmosphere, global water cycle, carbon cycle science, biology and biochemistry of ecosystems, human dimensions of global change, and paleoenvironment / paleoclimate. Eight agencies and the Smithsonian Institution are involved in USGCRP. Highlights include:

**Improved Climate Observations** - The budget would provide \$26 million to enhance NOAA’s surface-based observations, including creation of a climate reference network to provide simultaneous, automated, and well

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located measurements of temperatures, precipitation, and soil moisture. Measurements of trace gases, aerosols, ocean temperatures, and currents would also be increased.

The Global Water Cycle - \$308 million, an increase of \$35 million, would support research on the Earth's water cycle. The launch of NASA's Aqua (PM-1) spacecraft in December, 2000, would support this research by providing new global measurements of humidity, cloud properties, precipitation, snow, and sea ice.

Ecosystem Changes - An increase of \$19 million would provide \$224 million for research on the potential impacts of climate change and other stresses on forests, coastal areas, croplands, and other ecosystems. New studies would help identify "thresholds" for significant changes in ecosystems.

Carbon Cycle Initiative - The budget request would continue the support for the multi-agency carbon cycle science initiative begun in FY 2000. It would provide \$227 million, an increase of \$23 million, to study how carbon cycles between the atmosphere, oceans, and land as well as the role of farms, forests, and other natural or managed lands in capturing carbon.