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## Fiscal Year 2005- 2006 Accelerated Research on Global Climate Observations *Fact Sheet*

Coincident with the release of the Climate Change Science Program strategic plan, the Administration announces plans for the acceleration of select high priority research projects and climate observations. These activities contribute to filling critical knowledge gaps identified in the plan (aerosols, oceans and the natural carbon cycle). The selected investments have been coordinated among the agencies to maximize the overall impact. Funding will be reallocated from lower priority areas to enable these critical investments.

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### Reduce Scientific Uncertainty of Aerosols

Aerosols are tiny particles in the atmosphere such as soot and dust. Some aerosols, like sulfates, reflect incoming sunlight and, thus, cool the atmosphere. For some aerosols like soot or black carbon, it is uncertain whether they heat or cool the atmosphere. Aerosols also make cloud water droplets smaller so that this type of cloud reflects more sunlight and, thus, cools the atmosphere. Observations of the global and vertical distributions of size, composition, physical and optical properties of aerosols are needed to determine whether the overall effect of aerosols enhances heating or cooling of the atmosphere. With new observations, the uncertainty about the role of aerosols in climate science will be reduced.

DOE (\$12.5M, FY2005; \$12.5M, FY2006) will investigate aerosol - cloud interactions with measurements of the vertical distributions of the amounts, types and optical properties of aerosols, clouds and of other atmospheric variables at its three Atmospheric Radiation Measurement (ARM) sites, with a planned mobile ARM facility, and with unpiloted aerial vehicles to improve quantification of aerosol forcing in climate models.

NASA (\$10M, FY2005; \$10M, FY2006) will accelerate development of the Advanced Polarimeter Sensor (APS), including integration and test of instrumented spacecraft and preparation of algorithms to interpret satellite measurements. The APS will provide global observations of vertical distributions of aerosol size and composition.

NOAA (\$5M, FY2005; \$5M, FY2006) will measure vertical distributions of aerosols at selected locations from ships and airplanes to analyze the interactions of aerosols and clouds.

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### Reduce Scientific Uncertainties of Carbon Sources and Sinks and of the Water Cycle

The size and natural variability of the Earth's sources and sinks of carbon and carbon transport mechanisms are not sufficiently known for evaluating carbon sequestration opportunities. The integrated North American

Carbon Program (NACP) is a key element for understanding the global carbon cycle. The Program will reconcile approaches for quantifying carbon storage and improve our understanding of important processes regulating carbon transfer between the atmosphere and the land and ocean. Similarly to the carbon cycle, the variability and transport mechanisms of water throughout the environment (water vapor, liquid water in the atmosphere, fresh water and sea water) require substantial advancements in knowledge to improve climate modeling.

NSF (\$10M, FY2005) will establish accurate estimates of the magnitudes of terrestrial and oceanic carbon sinks and their regulating mechanisms, and will accelerate efforts to understand the impacts of historical and current land use patterns and trends on local and continental scales. Also, NSF will augment water cycle investigations.

NOAA (\$4M, FY2005; \$4M, FY2006) will accelerate deployment of tower-and aircraft-based measurements of the vertical profile of carbon dioxide in North America, and will produce maps of regional sources and sinks of carbon dioxide in the U.S.

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## Improve Climate Observing System in the World Ocean

High quality long duration data records to detect climate variations are few, and those that exist have been recorded at land-based stations. Until about 25 years ago, the ocean was observed only from ships at a very small number of sites and at infrequent times. Beginning in 1978, satellite observations provided frequent global coverage of the world ocean. New technology is currently available to verify satellite observations at the sea surface and record the interior of the ocean.

NOAA (\$10M, FY2005; \$10M, FY2006) will accelerate deployment of moored and free-drifting buoys to measure ocean temperature and other variables to detect natural oscillations within the global ocean.

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## Improve Climate Modeling Systems

A model is an essential tool to synthesize observations, theories, and experimental results. A model assimilates sparsely sampled data, in both space and time, and produces numerical simulations at uniform space and time intervals using sophisticated methods of interpolation and extrapolation. A good model can make valuable predictions of future conditions of the environment. Cyber infrastructure enhances the effectiveness of climate modeling systems by facilitating data access, analysis and interpretation.

NSF (\$5M, FY2005; \$5M, FY2006) will support cyber infrastructure activity to accelerate the use of advanced computational technology for the community's ability to carry out scientific analysis and visualization of measurements and model results and for decreasing the time to access, assemble and interpret large volume complex climate change information and data sets at locations distributed throughout the world.

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