FY 2004 President's Request

Climate Change Research Initiative

Reducing Uncertainties in Climate Change Scenarios

Addresses

NOAA Mission Goal #2

Understand climate variability and change to enhance society's ability to plan and respond

What is requested?

NOAA requests $1M to support research that will yield improved decision-support tools associated with a key element of climate-change scenarios. This research will focus on a better understanding of the absorption and scattering of radiation by aerosols (fine airborne particles) and the associated heating and cooling roles in the climate system. The research draws upon the scientific talents in several NOAA organizations, is coordinated nationally and internationally with partner agencies and academia, is guided by priorities established by the National Aerosol-Climate Interactions Program (NACIP), and addresses key information gaps identified by national and international scientific assessments.

Why do we need it?

Aerosols, small particles in the atmosphere, pose the largest measurement uncertainty in projecting climate change, and are believed to have climate impacts comparable in magnitude to greenhouse gases. While Greenhouse gases are monitored to high precision, aerosols are not measured accurately enough to determine annual and decadal changes in their impacts on climate. Aerosols can be released naturally, such as through volcanic eruptions or forest fires, or through human activities, such as with the burning of fossil fuels. Aerosols a play unique role in the storage and release of heat. Aerosols also reflect sunlight, causing a potential cooling effect, and can change cloud properties. Reductions in emissions of these fine particles offer a way to diminish human-induced climate change in coming decades. Consequently, effective scenarios in support of policy choices must include the study of aerosols, as has been underscored by the National Academy of Sciences' summary of the current understanding of climate science.

A quantitative understanding of the changes in climate caused by aerosols poses special research challenges:

- There are many types of aerosols in the atmosphere: sizes, shapes, chemical composition and hence varied reflective and absorptive properties.
- Aerosols arise from a variety of sources: human-influenced sources (e.g., electric power generation, transportation, and biomass combustion) and natural sources (e.g., wildfires and soil wind erosion).

CCRI Reducing Uncertainties At-a-Glance

What: $1.0 M increase

Why: Observations, laboratory studies and radiative modeling of the climate roles of aerosols.

- Aerosols atmospheric abundances and heat-releasing characteristics are poorly observed and measured, which requires many untested assumptions in model simulations;
- Aerosols are emitted to, formed within, and removed from the atmosphere via a variety of processes, and current simulations are based only on limited characterizations of the atmospheric processes that link emission sources to the resulting atmospheric distributions and heat-releasing properties; and
- Aerosols atmospheric distributions and properties vary greatly from region to region and through time, which implies the need for both regular (monitoring) observations, regional sampling of abundances and characteristics, and global mapping.

What will we do?

In response to the President's Climate Change Research Initiative, NOAA is instituting a special focus on the climatic roles of aerosols and tropospheric (lower atmosphere) ozone. Aerosols have important and unique roles in climate change and the development of improved scenarios in support of better-informed decision support. In FY 2004, the focus will be on observations, laboratory studies, and radiative (absorption and release of heat) modeling of the climatic roles of aerosols.

In FY 2004, NOAA will augment two foci: (I) The first will implement regular airborne measurements over selected sites and regions. These measurements will provide the first observational time series of the variations and trends associated with vertical distribution of aerosols, as well as their radiative properties at altitudes that most strongly relate to radiative forcing of climate change. (ii) The second will directly address the development of better decision-support tools. This research will improve the understanding of the connection between the sources of emissions of compounds that are or lead to climate-relevant aerosols, and the resulting regional distributions that cause the climate radiative forcing.

What are the benefits?

Over the next five years, NOAA will improve the observations of the climate-relevant aerosols associated with U.S. activities. NOAA will also improve the model-simulation of the connection between aerosols released in North America, both human-induced pollutants and natural emissions, and the changes in climate these aerosols cause.

The benefits of this information lie in several areas. Two major examples are: 1) As requested by the President, this research will provide a better science-based set of options for the Nation to consider related to the climate change issue, which strengthens the underpinnings of any of the challenging policy decisions that lie ahead. 2) Since many of the emissions that lead to aerosols are pollutants that contribute to human health issues, this new understanding will allow the development of "win-win" scenarios.

For more information:

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FY 2004 Proposed Climate Change Research Initiative Program Components:

- Global Ocean Observing System
- Carbon Cycle Atmospheric Observing System
- Aerosols
- Climate Change Science Program Office
- Climate Change Computing Initiative