

National Aerosol-Climate Interactions Program (NACIP) Executive Summary

A national research initiative

Aerosols, microscopic particles suspended in air, have increased significantly over the industrial period because of human activities. Climate models have shown that cooling of the Earth surface due to these increases in aerosols may have compensated for some or most of the greenhouse warming in many regions of the world. In addition observations have demonstrated reductions in sunlight and rainfall by extensive manmade aerosol layers. Trans-continental and trans-oceanic transport of aerosols leads to haze layers that, in some parts of the world, spread across an entire ocean basin or continent. These recent observations have linked aerosols to hitherto unanticipated, specifically regional climate changes. In spite of a broad, international range of scientific research programs, present understanding of aerosols and particularly of their interactions with clouds is insufficient to quantify their influence on global and regional climate change over the last century.

Aerosols are also tied to other areas of public concern. The same aerosols that impact climate are key contributors to air pollution on local and regional scales. In regions of heavy pollution, aerosols are linked to health impairment and increased mortality, visibility reduction, and decreased agricultural productivity.

A National Aerosol-Climate Interactions Program is critically needed to focus new research on aerosols and their interactions with the climate system. NACIP will provide breakthroughs in understanding that are unlikely to be achieved in the next decade without a focused inter-agency initiative. NACIP findings will also help determine regional impacts of aerosols (e.g., on the hydrological cycle, fresh-water availability, agriculture, and ecosystems) and identify possible ties to climate mitigation strategies. In addition to coordination or redirection of existing U.S. research, substantial new research efforts are required: (i) to systematically measure the sources, distribution and properties of aerosols (particularly soot) and their influence on cloud formation and rainfall, globally on a region-by-region basis; (ii) to accurately represent aerosol impacts in climate models by linking their representation to these observations; and (iii) to quantify the relative importance of aerosols and greenhouse gases for global warming. An important responsibility of the new program will include preparation of regular state-of-the-science reports with estimates and uncertainties of aerosol forcing of climate on global and regional scales. Without this new initiative the national and international climate assessments planned for the coming decade would not be able to quantify the role of aerosols in global warming to date and therefore to confidently project climate change that would result from differing emissions scenarios.

Over 50 leading aerosol/climate scientists met in January 2002 to define the research thrusts of NACIP. A detailed research and management plan for NACIP is in preparation.

Prepared by the NACIP Scientific Steering Committee: V. Ramanathan (Chair), Timothy S. Bates, James E. Hansen, Daniel J. Jacob, Yoram J. Kaufman, Joyce E. Penner, Michael J. Prather, Stephen E. Schwartz, John H. Seinfeld.

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