www.epa.gov/airscience

science in ACTION

BUILDING A SCIENTIFIC FOUNDATION FOR SOUND ENVIRONMENTAL DECISIONS

CLEAN **AIR** RESEARCH PROGRAM

ATMOSPHERIC SCIENCE AT EPA FOCUSES ON IMPROVING AIR QUALITY

Issue:

Atmospheric scientists study the atmosphere's physical characteristics, its weather patterns or meteorology, and its chemistry. The best known application of this collective knowledge is forecasting the weather.

Atmospheric science is also important to the study of air pollution. At the U.S. Environmental Protection Agency, the Clean Air Research Program in the Office of Research and Development is leading a research effort to better understand how air pollutants are formed, how they interact with one another, and where they come from and go.

Research in atmospheric science provides information to EPA, states and others to develop strategies to reduce air pollution and to evaluate the effectiveness of various control measures.

Describing or characterizing the often complex composition of outdoor (ambient) air pollution and explaining where various pollutants come from is challenging. The complex and dynamic chemistry is often difficult to capture as pollutants vary during different times of the day and by their location.

Integrated science that includes laboratory and field studies is needed to better understand air pollution. Laboratory studies offer scientists the opportunity to understand the processes associated with the formation and distribution of air pollutants under controlled circumstances. This knowledge is used to develop theory for model development. Field studies are also important in that they provide measurements in real-time that can be used to assess models and develop other scientific tools.

Scientific Objective:

Scientists in the Clean Air Research Program explore every aspect of the "life" of an air pollutant— from formation and transformation with co-pollutants, to how they are transported and come in contact with humans. Specifically, researchers work to answer questions such as:

- What are the various sources of air pollutants?
- How do the types of air pollutants form, age, and change in the atmosphere?
- How are air pollutants transformed and transported in the atmosphere?
- What chemical processes are important in the formation and transformation of air pollution, especially ozone, particulate matter, and air toxics?

continued on back

CLEAN **AIR** RESEARCH PROGRAM

continued from front

- How can air pollution best be monitored? What instruments and techniques are needed to monitor pollutants?

- What tools can be developed to support efforts to reduce and control air pollution? How can computer models be improved to better represent air pollutants and their related processes in the atmosphere?

- How can the information about pollutant concentrations, fate and transport be included in models to estimate future concentrations?

Research areas include:

- Developing and evaluating the Community MultiScale Air Quality Model (CMAQ) for a variety of time and space scales for PM, ozone and air toxics.

- Understanding the chemistry of pollutants, particularly the formation of secondary organic aerosols (SOAs) by learning about their physical properties, and determining their exact chemical composition.

- Understanding factors and parameters of air pollutants such as concentration, chemical composition, size distribution, and source contribution.

- Developing and evaluating monitoring methods for implementation of the National Ambient Air Quality Standards.

- Identifying the various sources of a pollutant and determining the amount each source contributes to the outdoor concentration.

Application and Impact

The Clean Air Research Program's air quality research provides a strong scientific foundation for protecting the public from adverse impacts of air pollutants.

The methods, models, tools, and techniques are used by EPA to make decisions about air quality standards, provide information for conducting health studies and assist states to develop control plans for minimizing pollutants within their air sheds.

Atmospheric research enables air quality managers and regulators to determine what air pollutants are potentially harmful, what emissions should be targeted for reduction and how they can be controlled in the most cost effective and efficient way.

With the growing evidence of climate change and its expected impacts on air quality, atmospheric science will also provide key information to health effects research. This science will be used to better understand potential health implications of the evolving complexity of ambient air environment.

CONTACT

David Kryak,, National Exposure Research Laboratory, EPA's Office of Research and Development, 919-541-1457, kryak.david@epa.gov

Sherri Hunt, National Center for Environmental Research, EPA's Office of Research and Development, 202-343-9644, hunt.sherri@epa.gov.

JANUARY 2009