In summer of 2004, NOAA is helping to lead one of the largest field studies ever conducted on climate and air quality. Colleagues from five nations are engaged in the endeavor, which extends from the western U.S. to continental Europe.
The Issues: Air Quality and Climate

Ozone and Fine Particles
Ozone and particles are formed in the atmosphere when pollutants mix and react in the presence of sunlight. These precursor compounds are emitted by a variety of sources, both natural (e.g., forests) and manmade (e.g., automobiles and power plants). Particles are also emitted directly by a number of sources (e.g., power plants and diesel trucks and buses). Ozone and fine particles are factors in causing poor air quality, which has harmful effects on human health, agriculture, forests, and visibility. In addition, they are important in Earth’s climate because they interact with radiation and affect the planetary energy balance.

New England: A Focus on Air Quality
Several counties in southern New England are failing to meet the EPA standards for ozone and/or particulate matter; that number could triple when more stringent standards are enforced. New England air quality is determined not only by their “homemade” pollution, but also by pollution transported from afar. Causes of the poor air quality are complex and unique to the New England region. The region’s decision makers are in need of a solid scientific understanding of the sources and processes that impact New England’s air quality. The New England Air Quality Study is designed to meet this critical need. A scoping study in summer of 2002 and a more comprehensive 2004 study are providing an expanded view of the chemical and physical processes that control pollution formation and transport throughout New England (an in-depth “3-D” perspective).

Climate: A Transcontinental Influence
Natural and anthropogenic emissions react in the atmosphere to produce gases and aerosol particles that affect climate because they absorb and scatter sunlight. These species are long-lived in the atmosphere and their influence extends beyond national boundaries. Tracking the sources, atmospheric transformations, and intercontinental transport of these species is of relevance to U.S. and international climate interests.
NOAA’s Foci in ICARTT

In ICARTT, NOAA is conducting joint research activities that connect the closely linked issues of regional air quality and climate. The approach maximizes the value of the data collected while minimizing the deployment costs.

Transport into New England from various source regions, and the implications for regional air quality, e.g.,

- U.S. East Coast cities (Bos-NY-Wash)
- Midwest power plants

Transport of pollution to the North Atlantic and Europe, and the implications for climate

- Over ground sites in U.S., Canada the Azores
- NASA, European, other aircraft collaborate in tracking air masses

Evaluation of air quality models

- For tomorrow’s air quality forecast
- To support regional air quality decision making

Anticipated Benefits

Direct Payoffs for Decisiomakers

- Evaluation of skill of models used to develop air quality management strategies
- Quantification of impacts of local and distant sources on New England air quality
- Identification of the unique properties of New England aerosol particles that may impact public health
- Identification of the role that forest emissions play in shaping New England air quality and how they can be impacted
- Quantification of impact of U.S. emissions on global air quality and the Earth’s radiation balance

In New England...

The planned research will address significant information gaps and deliver sound science leading to an improved understanding of the processes that influence the air pollution levels to which the citizens of New England are exposed.

...and Beyond

The research is an integral part of NOAA’s effort to develop the tools needed to provide reliable air quality forecasts. The New England area will be an initial test bed for NOAA’s air quality forecasting system. The routine and intensive data sets will provide a means to evaluate alternative forecast approaches and fine-tune the chemical observing system that may be needed in a nationwide implementation. In addition, the research will lead to a better understanding of the linkages between air quality and climate, information that will aid decision making in both arenas.
NOAA Assets at Work in ICARTT

wp-3d research aircraft
pease airport

r/v ronald h. brown
u.s. east coast and gulf of maine

airborne ozone/aerosol lidar
pease airport

DC-3

ground sites and wind profiler network

air quality models

shipboard and airborne meteorological and chemical instrumentation

meteorology and chemistry ground sites

chebogue point, nova scotia

NOAA Participants

aeronomy laboratory
air resources laboratory
atlantic oceanographic and meteorological laboratory
climate monitoring and diagnostics laboratory
environmental technology laboratory
forecast systems laboratory
geophysical fluid dynamics laboratory
pacific marine environmental laboratory
national weather service
national environmental, satellite, data, and information service
NOAA marine and aviation operations

Partnerships

Hundreds of scientists in five countries — the U.S., Canada, Great Britain, Germany, and France — are involved in the ICARTT endeavor. Major U.S. federal partners include NASA, NSF, DOE, and EPA. Major partners in academia include scientists in the NOAA cooperative institute AIRMAP (Atmospheric Investigation, Regional Modeling, Analysis, and Prediction), University of New Hampshire, Harvard University, and the California Institute of Technology. The capabilities represented by the consortium are allowing an unprecedented characterization of the key atmospheric processes in two connected issues: regional air quality and climate.