

# NOAA

and

# ICARTT

International  
Consortium for  
Atmospheric  
Research on  
Transport and  
Transformation



NOAA WP-3D

air



NOAA R/V *Ronald H. Brown*

sea



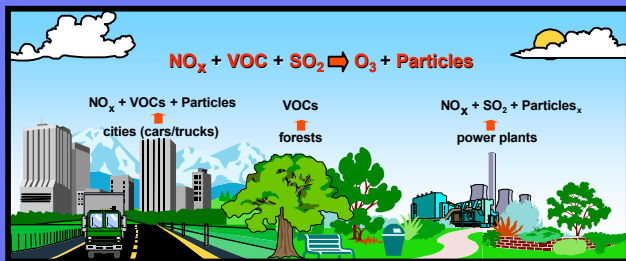
In summer of 2004, NOAA is helping to lead one of the largest field studies ever conducted on climate and air quality. Colleagues from five nations are engaged in the endeavor, which extends from the western U.S. to continental Europe.



Azores Station

land

# The Issues: Air Quality and Climate



## Ozone and Fine Particles

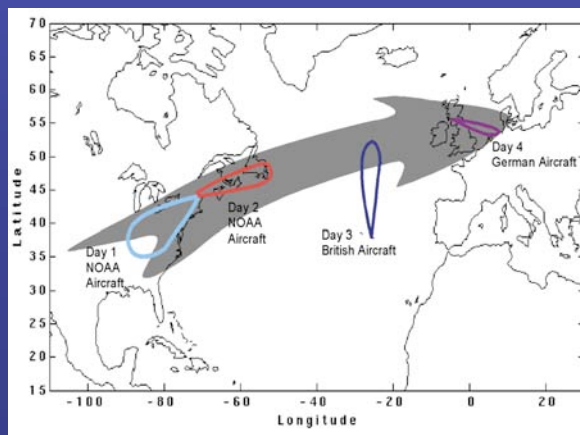
Ozone and particles are formed in the atmosphere when pollutants mix and react in the presence of sunlight. These precursor compounds are emitted by a variety of sources, both natural (e.g., forests) and manmade (e.g., automobiles and power plants). Particles are also emitted directly by a number of 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).



Urban and industrial pollution finds its way to New England by land and sea.



## Climate: A Transcontinental Influence

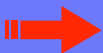
Natural and anthropogenic emissions react in the atmosphere to produce gases and aerosol particles that affect climate because they absorb and scatter sunlight. These species are long-lived in the atmosphere and their influence extends beyond national boundaries. Tracking the sources, atmospheric transformations, 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.,

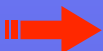
- U.S. East Coast cities (Bos-NY-Wash)
- Midwest power plants



- What is the role of long-range transport in shaping New England's air quality?
- What is the role of the sea-breeze/land-breeze in local and regional air quality in New England?
- What are the relative contributions of manmade and biological emissions in the production of ozone and fine particles?

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

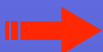
- Over ground sites in U.S., Canada the Azores
- NASA, European, other aircraft collaborate in tracking air masses



- How is pollution from the East Coast transformed and transported to the North Atlantic and Europe?
- Which synoptic patterns are associated with high pollution events in New England?

### Evaluation of air quality models

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



- How well do current air quality forecast models predict ozone (operational evaluation)?
- How well do these models reproduce the observed chemistry and meteorology (diagnostic evaluation)?
- What improvements in model design or operation are needed to significantly improve forecast skill?

## Anticipated Benefits

### Direct Payoffs for Decisionmakers

- 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.

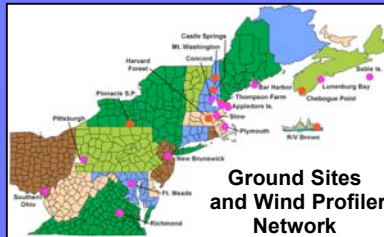
# NOAA Assets at Work in ICARTT



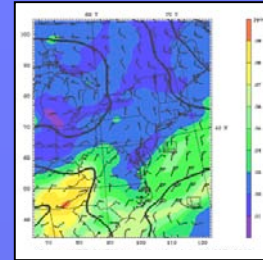
WP-3D Research Aircraft  
Pease Airport



R/V Ronald H. Brown  
U.S. East Coast and Gulf of Maine



Ground Sites  
and Wind Profiler  
Network



Air Quality Models



Shipboard and Airborne  
Meteorological and Chemical  
Instrumentation



Airborne Ozone/Aerosol Lidar  
Pease Airport



DC-3




Chebogue Point, Nova Scotia




Meteorology and Chemistry  
Ground Sites

## 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.