National Oceanic & Atmospheric Administration
Air Resources Laboratory
Air Quality Research and Development

What We Do

The Air Resources Laboratory (ARL) conducts a world-class research and development program addressing air quality measurements and monitoring, and forecast and assessment modeling. ARL's products directly support air quality decision-makers, air quality forecasters, and the research community. The specific focus of this program is on measuring and modeling air-surface exchange of pollutants and the development and application of air quality and deposition models.

Air-Surface Exchange of Pollutants

ARL is a world leader in improving the understanding of how particles and gases released into the air are exchanged with the Earth's surface—termed air-surface exchange. ARL focuses on chemicals, primarily nitrogen, sulfur, and mercury compounds, which can have a significant impact on our environment—and in the case of mercury—human health.

An AIRMoN station at Lewes, Delaware. (Photo: NADP)

Chemical Measurements

In conjunction with the National Atmospheric Deposition Program (NADP), ARL conducts long-term, research-grade monitoring of the most abundant trace chemicals commonly found in precipitation. These substances include sulfur and nitrogen compounds, as well as chemicals found in soil and sea water. ARL's Atmospheric Integrated Research Monitoring Network (AIRMoN) provides data for the investigation of sources of these compounds and to evaluate the effectiveness of existing regulatory emission controls.

NOAA's mercury speciation equipment placed at Beltsville, Maryland. Photo: NOAA

To complement deposition monitoring, ARL conducts short-term field studies that test emerging chemical measurement technologies and improve the understanding of the atmospheric and terrestrial processes and factors (i.e., wind, temperature, surface roughness) controlling air-surface exchange of these compounds. Data from both AIRMoN and field studies are used to improve and evaluate modeling products.

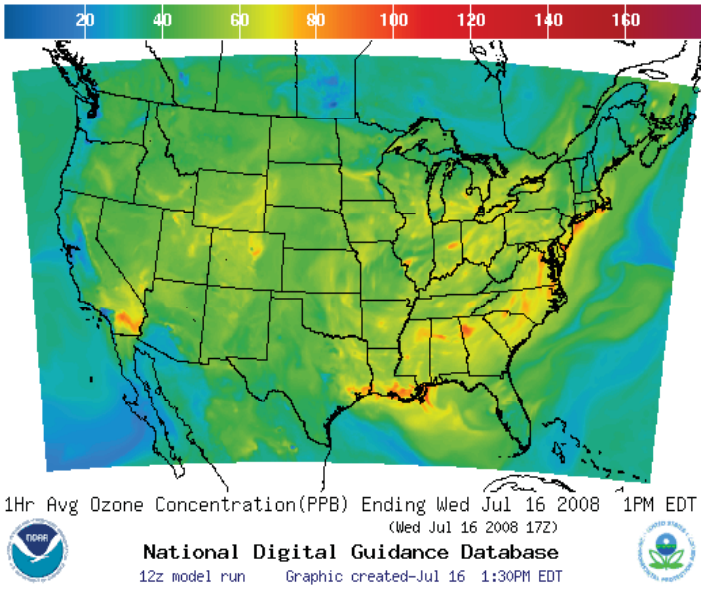
Mercury Compounds

ARL operates three long-term intensive ambient air mercury monitoring stations as part of a new multi-agency national monitoring network designed to address total mercury deposition across the country. ARL also conducts short-term intensive mercury studies at select sites across the country and around the world. In addition, ARL develops and applies a state-of-the-art modeling system that tracks mercury emission sources and the atmospheric fate and transport of mercury compounds. ARL interprets and evaluates this mercury modeling system using measurement and monitoring data.

Air Quality and Deposition Models

ARL develops models for short-term (1-3 days) predictions of air quality. Specifically, ARL develops and improves NOAA's operational modeling system for predicting ground-level ozone concentrations. ARL scientists are also developing models for predicting concentrations of very small particles in the air. These particles are produced from combustion processes (burning petroleum products, gas, and wood), volcanic emissions, and from chemical reactions in the atmosphere.

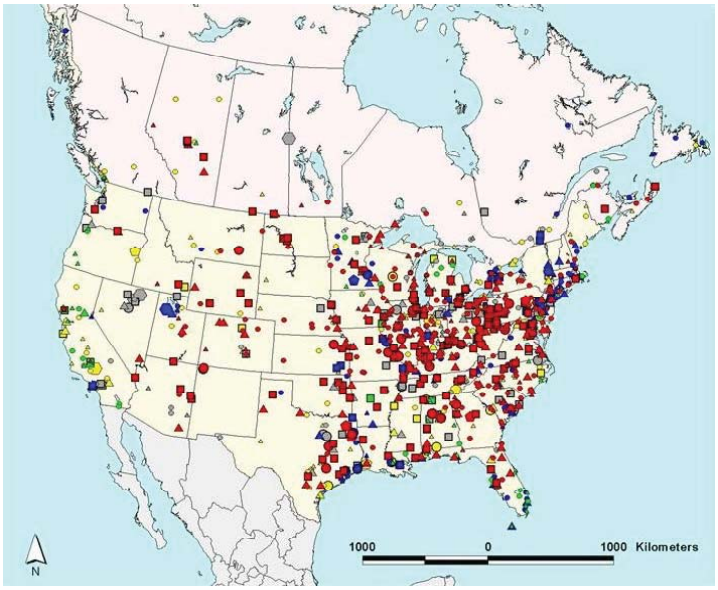
ARL also tests and improves the current generation of land surface models using observed data. These models address deposition of sulfur, nitrogen, and mercury compounds to sensitive ecosystems.



An example map of ground-level ozone concentrations predicted for the continental U.S. NOAA's National Weather Service generates such maps twice daily using an ARL-developed modeling system.

Why It Is Important

Air pollution has significant health, ecological, and economic consequences. Poor air quality contributes to tens of thousands of premature deaths annually from cardiovascular and respiratory diseases. The Nation spends tens of billions of dollars each year to reduce air pollution in order to protect human health and the environment.



An ARL map showing 2002 mercury emissions sources based on data from the U.S. EPA and Environment Canada

Effective targeting of air pollution controls depends on having good scientific understanding of which types of sources and which regions are contributing to air quality issues.

ARL's Air Quality Research and Development protects human and ecosystem health through:

- Predictive models for ozone and fine particles allow communities and individuals to mitigate the health impacts of poor air quality by reducing pollutant emissions and by taking personal protective measures.
- Research on air-surface exchange helps support the development of effective air quality policies and plans and more accurate air quality models to protect human and environmental health.
- Mercury research provides information about sources of atmospheric mercury that affect key ecosystems and human health so that effective air quality regulations and policies are developed.

For More Information:

Air Quality Forecast:
www.weather.gov/aq
Atmospheric Integrated Research Monitoring Network:
http://nadp.sws.uiuc.edu/AIRMoN/
ARL Air Quality R&D
www.arl.noaa.gov/AirQual.php

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