



Air Resources Laboratory

Atmospheric Dispersion Research and Development

Providing Modeling and Data to Better Predict Transport and Fate of Harmful Airborne Material

The accidental or intentional release of chemical, biological or nuclear agents can have significant health, safety, national security, economic, and ecological implications. The Air Resources Laboratory (ARL) provides essential tools and information for decision-makers and the research community to improve prediction of how, where, and when chemicals and materials are atmospherically transported and deposited. Having this understanding is critical for responding appropriately and preventing disaster.

What We Do

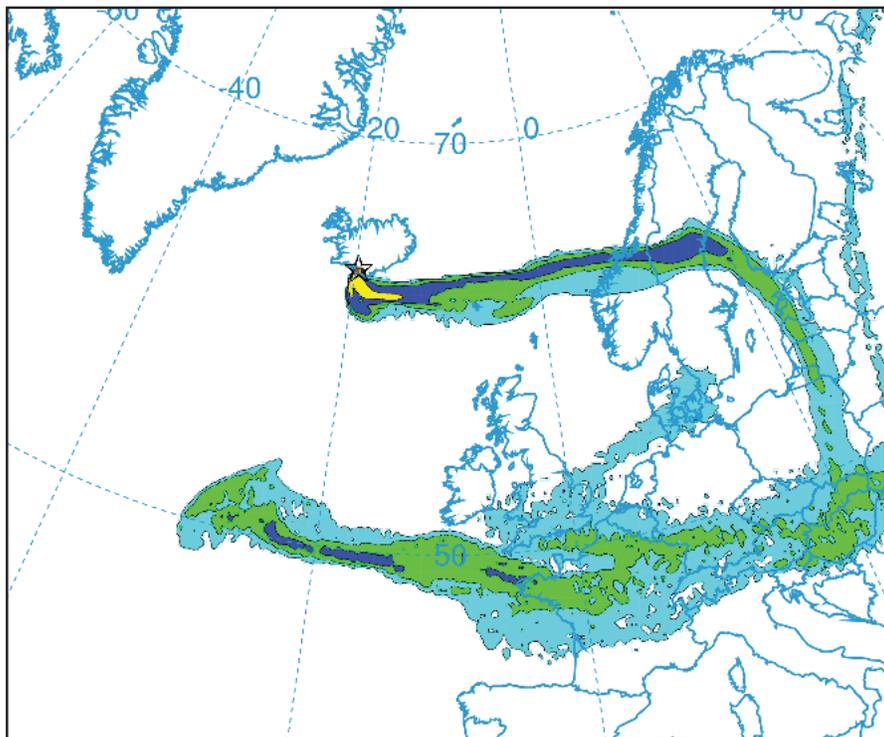
ARL focuses its Dispersion Research program on the development and improvement of sophisticated dispersion models and other tools for air quality and emergency response applications. This includes volcanic eruptions, forest fires, nuclear accidents, and homeland security incidents. ARL also designs and evaluates high resolution observing networks, develops instrumentation, and conducts tracer field studies to improve the accuracy of atmospheric transport and dispersion predictions.

Modeling

HYbrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) Model

ARL's HYSPLIT model is a highly-valued tool that helps explain the transport, dispersal, and deposition of chemicals and harmful material. HYSPLIT is used to track and forecast the release of radioactive material, volcanic ash, wildfire smoke, and pollutants from various emission sources. The strength of the dispersion modeling is the broad and effective transition from research to applications. Within NOAA, HYSPLIT is run operationally by the National Weather Service's National Centers for Environmental Prediction for a variety of events. It is also heavily relied upon by local Weather Forecast Offices across the U.S.

This image shows the capability of the ARL HYSPLIT model for volcanic ash dispersion. The model was used for an internal NOAA exercise to simulate the airborne transport and dispersion of ash from the Eyjafjallajokull volcano eruption in Iceland. This image is for a 1-hour period several days after the initial eruption began. The complex ash-plume pattern (yellow, navy blue, green, light blue areas) results from the change in winds with time and space during the continuous eruption. The highest concentrations are in the yellow area near the volcano. The London Volcanic Ash Advisory Center (not the U.S.) had responsibility for issuing aviation advisories during this event based on previous international agreements.



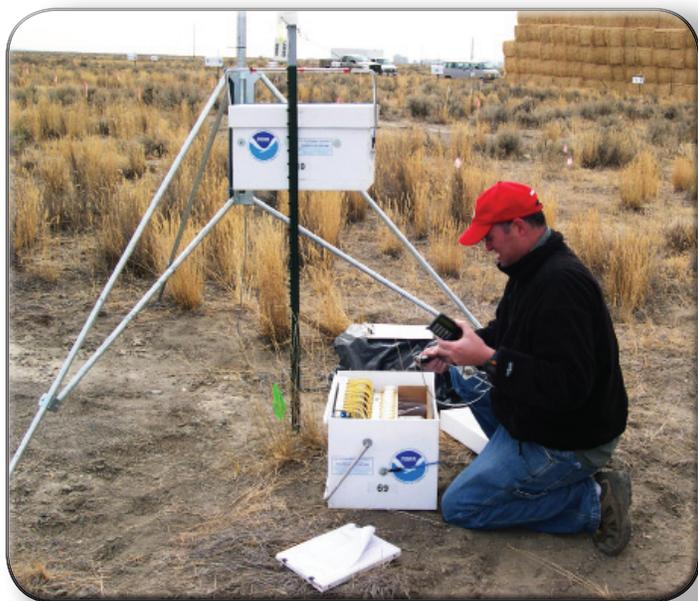
The Real-time Environmental Applications and Display sYstem (READY)

READY is a web-based system developed by ARL to access and display meteorological data and to run trajectory and dispersion simulations. The System is unique in that it brings together the HYSPLIT model, graphical displays, and textual forecasts into a form that is readily available and easy to use by anyone. READY is particularly useful for weather and air quality forecasters, but it is also used by weather-sensitive industries and hobbyists (e.g., balloonists, hang gliders) and the general public.

Observations

High Resolution Observing Networks

ARL designs and evaluates high resolution meteorological observing networks (e.g., stations typically 10 miles or less apart—compared to 100 miles or more apart for the national weather observing network) to capture small-scale air flows that can have a significant impact on how and where airborne chemicals and materials are transported. ARL also evaluates how this high resolution information can be incorporated into NOAA's large-scale weather models to improve their predictions of surface wind fields.



ARL meteorologist programming an atmospheric tracer sampler for an air pollution study conducted for the U.S. EPA. Photo: NOAA



ARL performs routine maintenance of one of the meteorological stations located at the top of Big Southern Butte in Idaho. Photo: NOAA

Field Studies

The flow of airborne materials in urban, coastal, and mountainous regions is very complex. Terrain, water, and man-made structures distort the wind fields that carry materials. To improve and evaluate dispersion models, it is important to gather field data on atmospheric flows in different types of situations. ARL collects such data by tracking the concentrations of tracer materials that can be readily followed back to a known source. This provides basic information required to ground truth dispersion models used for emergency response applications.

READY
www.arl.noaa.gov/ready.php

HySPLIT Model
www.arl.noaa.gov/HYSPLIT_info.php

ARL Transport & Dispersion R&D
www.arl.noaa.gov/atmosDisp.php

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