# Air Resources Laboratory

## Field Research Division

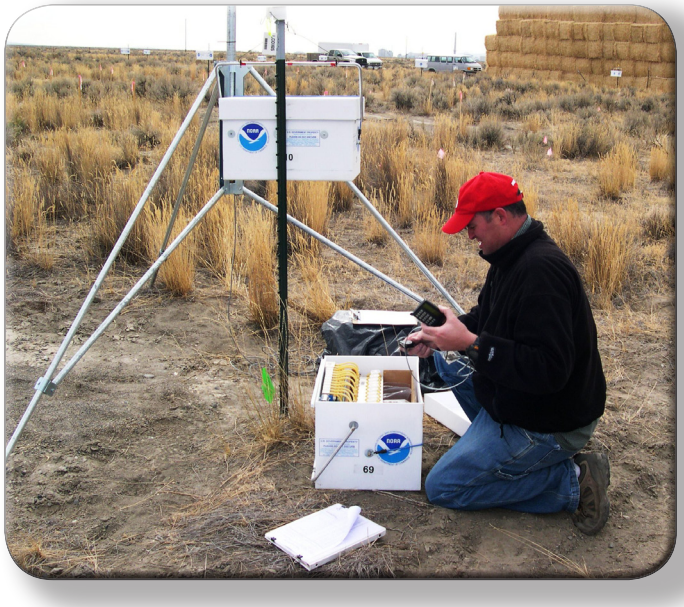
## Idaho Falls, Idaho

**Improving the understanding of atmospheric transport, dispersion, and air-surface exchange processes**

The Field Research Division (FRD) of the Air Resources Laboratory is located in Idaho Falls, ID. The Division is composed of talented meteorologists, engineers and technicians well known in the field of atmospheric dispersion. Originally a part of the U.S. Weather Bureau, FRD was created in 1948 for the purpose of describing the meteorology and climatology surrounding the area of the National Reactor Testing Station, now known as the Department of Energy's Idaho National Laboratory (INL). In a cooperative agreement between NOAA and the U.S. Department of Energy, FRD's capabilities are used to support the INL with meteorological measurements, mesoscale modeling and forecasts, and atmospheric dispersion modeling in the event of an accidental chemical or radiological emergency at the INL. In addition to supporting the INL, FRD scientists conduct field research, along with its many partners, all around the world.

## What We Do

FRD's science helps advance the understanding of processes occurring in the atmospheric boundary layer (the layer of the atmosphere closest to and most influenced by the ground). Through studies of atmospheric transport, dispersion, and air-surface exchange of particles and gases, FRD supports its customers' abilities to determine appropriate emergency actions or policy responses. For example, FRD's science helps air quality managers become better informed about how and where air pollution is moving and what populations may be affected. Using this science-based information, air quality controls and regulations can be improved. FRD's science also helps improve forecasts of hurricane movement and intensity to increase the safety of residents living in hurricane-prone areas. At the local level, FRD's science specifically helps ensure the safety of INL personnel and neighboring residents.



*FRD meteorologist setting up an atmospheric tracer experiment for a roadway barrier study. Photo: NOAA*

*Meteorological tower on the summit of Big Southern Butte. INL mesonet, Photo: NOAA*

## *Division Activities*:

Atmospheric Tracers

FRD is a pioneer in atmospheric tracer experiments, which date back to the 1960s. Tracer experiments involve the controlled release of a non-toxic gas at low concentrations and the subsequent tracking and measurement of the gas as it is transported and dispersed through the atmosphere. This "tracer" mimics the dispersion characteristics of an actual toxic gas release, thereby permitting evaluation of toxic gas dispersion models. Many of FRD's tracer studies since 2000 have focused on dispersion in cities. The tracer studies help air quality regulatory agencies, for example, understand dispersion of vehicle emitted pollution into neighborhoods near high-traffic roadways. Tracer experiments also are important to national security should a toxic gas be released during an accidental or terrorist event.

Meteorological Instrumentation and Mesonets

FRD has decades of experience designing, developing and deploying both permanent and temporary meteorological instrumentation, as well as establishing and operating mesonets (networks of meteorological monitoring towers and associated sensors). In a mesonet, instrumentation is carefully selected to permit a coordinated remote collection of data from the various sensors. Temporary mesonets are used in support of short-term air quality and tracer dispersion studies, while permanent mesonets are used for long-term support of regulated facilities and for climate studies.

*FRD technician deploying an ET probe on a tower placed at the end of a 560 meter pier in Duck, NC. Photo: NOAA*

Radar Wind Profiler and Sodar

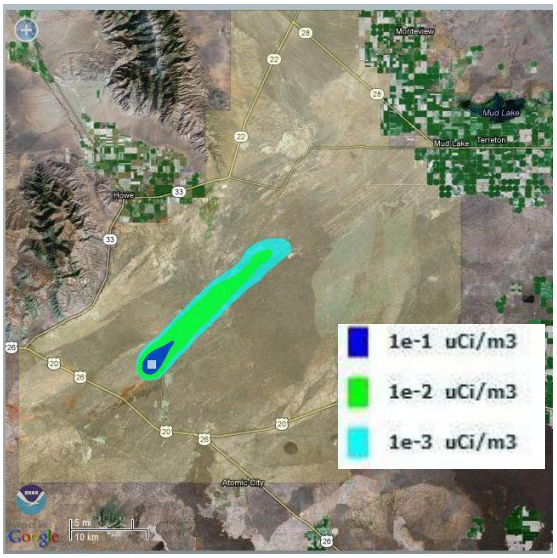
FRD maintains two types of unique portable remote sensors (a radar wind profiler and two mini-sodars) that are used to acquire wind profiles in the atmospheric boundary layer. Radar wind profilers use radar pulses whereas sodars use pulses of sound to measure wind profiles. The radar profiler and sodars are used to support field experiments, such as atmospheric tracer or air quality studies. They have also been used to help improve short-term wind forecasts for wind-generated electricity as part of the Department of Energy's WInd Forecast Improvement Project.

Extreme Turbulence Probe

FRD's Extreme Turbulence (ET) probe is an innovative turbulence sensor that can be placed on a stationary tower or an open water buoy and is designed to make accurate measurements in extreme weather conditions (hurricane-strength winds and rain) without being damaged. Prototypes of the probe were deployed for a few days during landfalls of hurricanes Frances and Ivan along the coast in 2004. The probes were highly successful in collecting measurements while exposed to heavy rain and winds up to 50 meters per second. Recent modifications to the probe have allowed FRD to deploy it on over-water platforms and to collect data for months at a time during the hurricane season.

Modeling

FRD has been developing and testing transport and dispersion models since the 1960s as a part of its collaboration with the INL. FRD applies a mesoscale meteorological model, the ARL HYbrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model and two other types of transport and dispersion models to help emergency managers determine where an accidental or intentional release of a hazardous material is moving and how fast the concentration is decreasing. Managers can then determine who is at risk so that appropriate evacuations can be instituted, if necessary. Managers can also determine from which direction emergency personnel should approach to avoid exposure themselves.




*Example of a HYSPLIT model plume simulation of a hypothetical pollutant release (in microCuries per meter cubed) in Southeastern Idaho.*

## Our Partners

- U.S. Department of Energy
- Idaho National Laboratory
- State of Idaho-INL Oversight Program
- U.S. Environmental Protection Agency
- Defense Threat Reduction Agency
- U.S. Department of Homeland Security
- Environmental Science and Research Foundation
- National Weather Service Forecast Office in Pocatello, Idaho
- Academic institutions: University of Utah and Idaho State University

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*The FRD facility is located in the Upper Snake River Plain of Southeastern Idaho. Photo: NOAA*

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