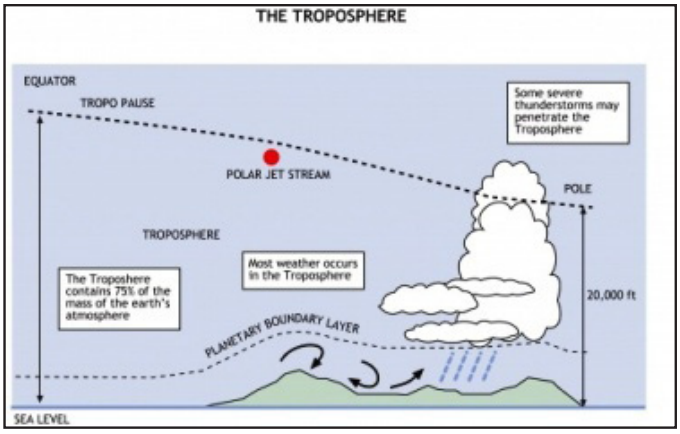
Air Resources Laboratory

Atmospheric Boundary Layer Research

Improved Prediction of Surface and Near-Surface Weather and Climate Conditions

Our primary focus at the Air Resources Laboratory (ARL) is the atmospheric boundary layer, the mixed layer of the atmosphere closest to the Earth's surface. This dynamic layer is influenced by complex interactions between the atmosphere and the underlying land and water surfaces. The boundary layer has significant influence on multiple critical issues, including weather; air pollution; the airborne dispersal of harmful materials; the impact of low-level winds and turbulence on aviation and wind energy production; regional climate changes; the evolution of hurricanes; and the behavior of wildland and agricultural fires and the smoke they produce.



A schematic of the Troposphere, showing the area of the Planetary Boundary Layer. Source: http://www.skybrary.aero/index.php/Planetary_Boundary_Layer

At ARL, we collect high-quality surface and near-surface data of weather and climate conditions essential to improving the accuracy of atmospheric models and other forecast and prediction tools. We study physical and chemical parameters and processes and use both measurements and models to advance, evaluate, and improve knowledge; placing a strong emphasis on developing improved scientific tools and transitioning them to operational products.

The ARL sUAS in a test flight at the Knox County Radio Control Society's model flying field near Knoxville, TN. The sUAS collects boundary layer measurements. Photo: NOAA

The ARL BAT probe positioned on the nose of the Centaur aircraft to measure turbulence in the boundary layer. Photo: NOAA

A few examples of our research are:

The use of ARL's fleet of small Unmanned Aircraft Systems (sUAS) to collect *in situ* boundary-layer data to fill the data gap between land-based measurements and satellite remote sensing measurements. The sUAS provides an inexpensive platform capable of capturing the dynamics of a developing boundary layer and linking that development to observed changes to the heat and water fluxes at the land surface.

The use of the ARL Best Aircraft Turbulence (BAT) probe, a custom-designed wind sensor that is mounted to the front of an aircraft to make high- frequency measurements of atmospheric pressure, air temperature, and atmospheric turbulence in the boundary layer. The BAT was part of a new airborne instrument system used to measure fluxes of carbon dioxide and methane, two important greenhouse gases, in Alaska.

For More Information, Contact:

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