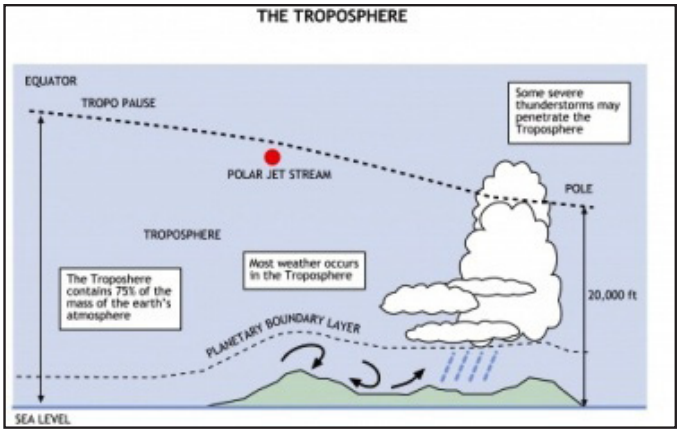
Air Resources Laboratory

Atmospheric Boundary Layer Research

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

The atmospheric boundary layer is the mixed layer of the atmosphere closest to the Earth's surface. This layer is dynamic and changes in response to interactions between the underlying land and water surfaces and the atmosphere. The boundary layer is the area most in contact with people, and its behavior is directly influenced by what exists and occurs at the surface. Likewise, the boundary layer has significant influence on a number of issues people care about, including the airborne dispersal of harmful materials; air pollution; the impact of low-level winds and tubulence 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

The Air Resources Laboratory (ARL) studies the atmospheric boundary layer by collecting essential data of surface and near surface weather and climate conditions used to improve the accuracy of atmospheric models and other forecast and prediction tools. ARL's Atmospheric Boundary Layer Research is an integral component of its other research programs: Atmospheric Transport and Dispersion, Atmospheric Chemistry and Deposition, and Climate Observations and Analyses.

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

A few examples of this research are:

The use of the ARL small Unmanned Aircraft Systems (sUAS) to collect missing data 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 between the surface of the Earth and the lower part of the atmosphere. 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.

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

For More Information, Contact:

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