Recent Results from the Airborne Tropical Tropopause Experiment (ATTREX)

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The Airborne Tropical Tropopause Experiment (ATTREX) is designed to study the transport of water vapor and other trace gases in the tropical tropopause layer (TTL) over the Pacific Ocean, in order to understand how dehydration occurs in this region and how trace gases involved in ozone depletion and climate reach the lower stratosphere. For this mission, the NASA Global Hawk aircraft is carrying a suite of *in situ* and remote sensing instruments for gases, aerosols, radiation, and meteorology. Two deployments have occurred from NASA/Dryden Flight Research Center, with flights to the eastern and central tropical Pacific. Two more deployments, targeting the western equatorial Pacific, are planned for 2014 in Guam.

Over 100 vertical profiles from about 14 to 18 km have been obtained from the tropics to midlatitudes, as well as long sections at nearly constant altitude. Results are shown here from the Unmanned aircraft system Chromatograph for Atmospheric Trace Species (UCATS) instrument and other sensors. UCATS was configured to measure N_2O, SF_6, H_2, CH_4, CO, water vapor, and ozone. Intercomparisons between instruments mostly indicated agreement within expected uncertainties. Preliminary results have shown a mix of midlatitude and tropical air in the tropical and subtropical lower stratosphere. This is important for understanding the composition of air rising through the TTL and the tropical stratosphere, one of the central goals of ATTREX.

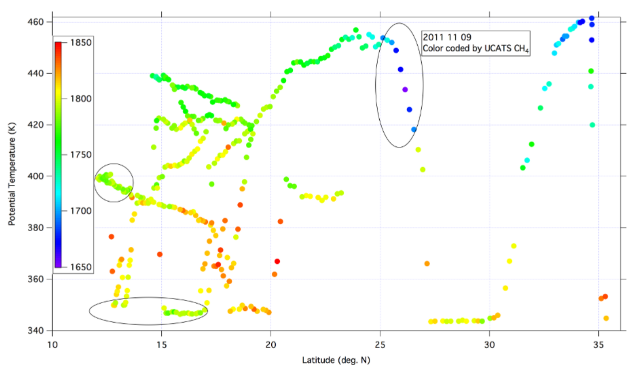

Figure 1. Flight track of the Global Hawk, November 9, 2011, color-coded by UCATS methane data. At 12-13°N, 390-400 K (circle), and 12-17°N, 340-350 K (horizontal oval) methane was lower (<1800 ppb) than in nearby air masses; this decrease was confirmed by concurrent flask samples. At 25°N (vertical oval), methane decreases sharply, suggesting an intrusion of high latitude air.

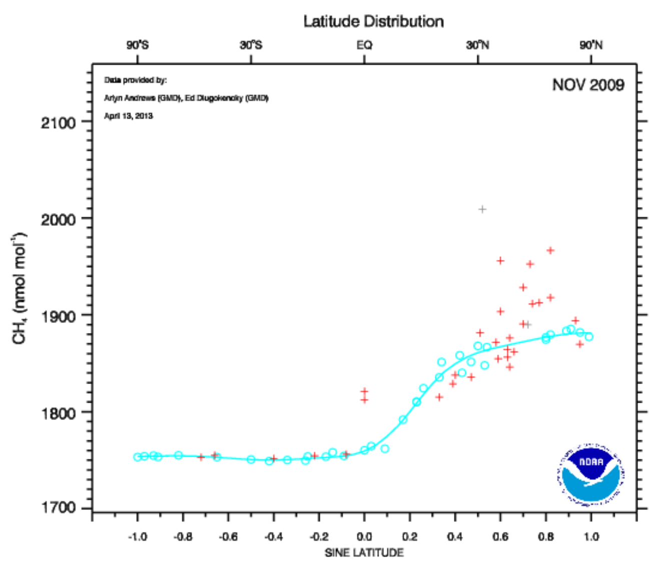

Figure 2. Surface measurements of methane in the same month, showing the latitude distribution of the tropospheric source.