The NOAA ESRL Airborne Aerosol Observatory: An Overview of the First Year of Operations

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The first regular flights of the NOAA ESRL Airborne Aerosol Observatory (AAO) were conducted out of Champaign, IL in June 2006. The AAO is installed on a Cessna T206H aircraft, with the capability to fly the payload to over 4600 m (15000 ft) above sea level and for flight durations of up to 4.5 hours. Through the end of March 2007, a total of 88 flights have been flown, an average of ~ 10 per month. The AAO payload includes measurements of the optical, microphysical, and chemical properties of atmospheric aerosols. An isokinetic aerosol inlet designed to minimize aerosol losses is employed to bring aerosol particles to the measurement systems. Aerosol light scattering and absorption coefficients are measured for dry aerosols, and light scattering at several relative humidities is also measured to determine the aerosol hygroscopic growth factor. Total particle number concentration and aerosol size distribution are measured, and Mie calculations using these measurements are routinely used to compare calculated scattering with the measured scattering coefficients. A Particle-Into-Liquid Sampler (PILS) system is used to measure aerosol major ion composition at a time resolution of 3 minutes. AAO gas measurements include continuous ozone and trace gases (carbon cycle, N_2O, CFC's, halons, HFC's, HCFC's, etc.) using flasks for subsequent analysis.

This poster describes results from the first 9 months of operation of the AAO. AAO measurements are compared with co-located aerosol measurements made during overpasses of the A-Train constellation of satellites (AQUA, CALIPSO) and the TERRA satellite. Figure 1 shows a CALIPSO lidar image (attenuated backscatter) and a vertical profile of the scattering coefficient during an AAO satellite underflight. Elevated aerosol layers were observed by both platforms. Aircraft measurements at the lowest flight level are also compared with concurrent measurements during fly-bys of ESRL instrumentation at the Bondville, IL surface station.

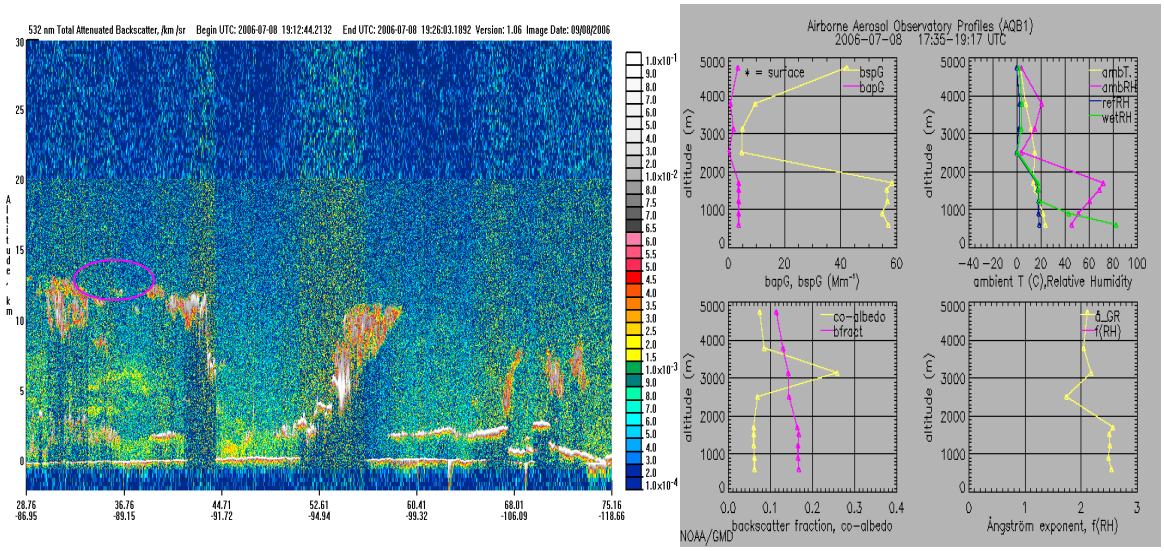

Figure 1. Aerosol layers (yellow pixels, circled) observed by CALIPSO lidar agree well with observations at higher altitudes (top left panel) in the AAO satellite under-flight profile.