Airborne Measurements of Aerosol Size Distributions and Related Physiochemical and Optical Properties During MILAGRO.

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The Hawaii Group for Environmental Aerosol Research [http://www.soest.hawaii.edu/HIGEAR] deployed a wide range of aerosol instrumentation aboard the C-130 and the NASA DC-8 as part of MILAGRO. These were designed to provide rapid information on aerosol composition, state of mixing (internal or external), spectral optical properties (scattering and absorption), the humidity dependence of light scattering-f(RH), and the role of condensed species in changing the absorption properties of black carbon (BC) and inferred properties of organic carbon (OC). These measurements include size distributions from about 7 nm up to about 10,000 nm and their volatility at 150, 300 and 400 C. Size selected response to heating (volatility) was also carried out using our Thermal Tandem DMA system that resolved the state of mixing of the aerosol. Continuous measurements of the light scattering and absorption at 3 wavelengths established the climatically important dry single scatter albedo (SSA) of the aerosol. Coupled with the f(RH) data from the NASA DC-8, the SSA could be also be extrapolated to typical ambient (wet aerosol) conditions. We flew the first airborne deployment of the new Fast Mobility Patricle Sizer (FMPS from TSI) that provided information on rapid (1Hz) data on size variations in the Aitken mode revealing small scale structure of the aerosol.

Flight 6 of the C-130 provided data on diverse aerosol types including pollution both over the Mexico City region and after about a day of aging downwind. This flight also included cases of elevated dust. We will use this flight to highlight examples of the above data and to explore the effects of plume aging as well as links between aerosol physiochemisty and optical properties. We also pioneered the first deployment of a thermal striping of the aerosol designed to examine the influence of internal mixtures upon the absorbing properties of BC. This revealed an enhancement in BC absorption by condensed species that up to about 20%. Applications of these data to other objectives such as multi-platform column closure, satellite validation and instrument evaluation will also be presented.