Particle-size distribution measurements on the NSF Gulfstream V

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A Scanning Mobility Particle Sizer (SMPS) has been developed for airborne measurement of atmospheric aerosol size distributions from 8 to 600 nm at the altitudes relevant to GV aircraft missions. These pressure/altitude regimes include 80kPa (~2000 m) to 15 kPa (~13000 m), the latter of which is high enough to be in the Upper Troposphere - Lower Stratosphere (UTLS) region. This ability to characterize aerosols up to the UTLS directly addresses important gaps in our knowledge of the impacts of aerosols on climate. Among the different climate forcing mechanisms documented by the Intergovernmental Panel on Climate Change (IPCC), the role that aerosols play continues to have the greatest uncertainty as indicated in the past several assessment reports.

The SMPS was developed through a collaboration between the Ultrafine Aerosols Group (Atmospheric Chemistry Division) and the Research Aviation Facility at NCAR. It was funded, in part, by a HIAPER GAP instrument grant. One feature of the SMPS is its ability to be configured to cover a wide range of particle diameters – it accomplishes this by accommodating different differential mobility analyzers and condensation particle counters. The first field deployment of the instrument was for the DC3 (Deep Convective Clouds and Chemistry) campaign, for which we configured the SMPS to measure over the diameter range from 8 to 150 nm. The specific scientific questions that will be addressed by our measurements include: What is the role of deep convection on particle transport and new particle formation, and how might this process influence climate through direct scatter/absorption or through cloud formation and modification? This poster will discuss the design and performance of the SMPS, and present altitude-dependent particle size distributions from the first flights of the DC3 campaign (May 2012).