Can New In Situ Measurements Offer Insight into Tropospheric and Stratospheric Transport?

F.L. Moore[1,2], J.W. Elkins[2], G.S. Dutton[1,2], and J.D. Nance[1,2]

[1]Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder 80309; 303-497-7068, Fax: 303-497-6290; E-mail: Fred.Moore@noaa.gov
[2]NOAA Climate Monitoring and Diagnostics Laboratory, Boulder, CO 80305

High altitude in situ measurements of trace gases where taken by PAN and other Trace Hydrohalocarbons Experiment (PANTHER) during the SAGE III Ozone Loss and Validation Experiment (SOLVE) II campaign. In this presentation we will outline the unique differences between the trace gases measured by the Lightweight Airborne Chromatograph Experiment (LACE) or Airborne Chromatograph for Atmospheric Trace Species (ACATS) using electron capture detectors (ECDs), and the new class of trace gases measured by PANTHER using a mass spectrometer (Figure 1). Our ECD-measured trace gases (CFC-12, CFC-11, CFC-113,CCl_4, N_2O, SF_6, CH_4, and H_2) that have relatively little free tropospheric structure. Gradients in the stratospheric mixing ratios for these trace gases are dominated by mixing processes between regions of stratospheric photochemical loss and the stable tropospheric air. The new class of molecules measured by PANTHER (HCFC-142b, HFC-134a COS, CH_3Cl, CH_3Br, HCFC-22) also have relatively long stratospheric lifetimes leading to relatively stable gradients in their stratospheric values. However, because of large tropospheric source and sinks, the free tropsoperic mixing ratios have both temporal and spatial gradients. We will describe how these new tropospheric gradients can be used to augment transport studies in the future.

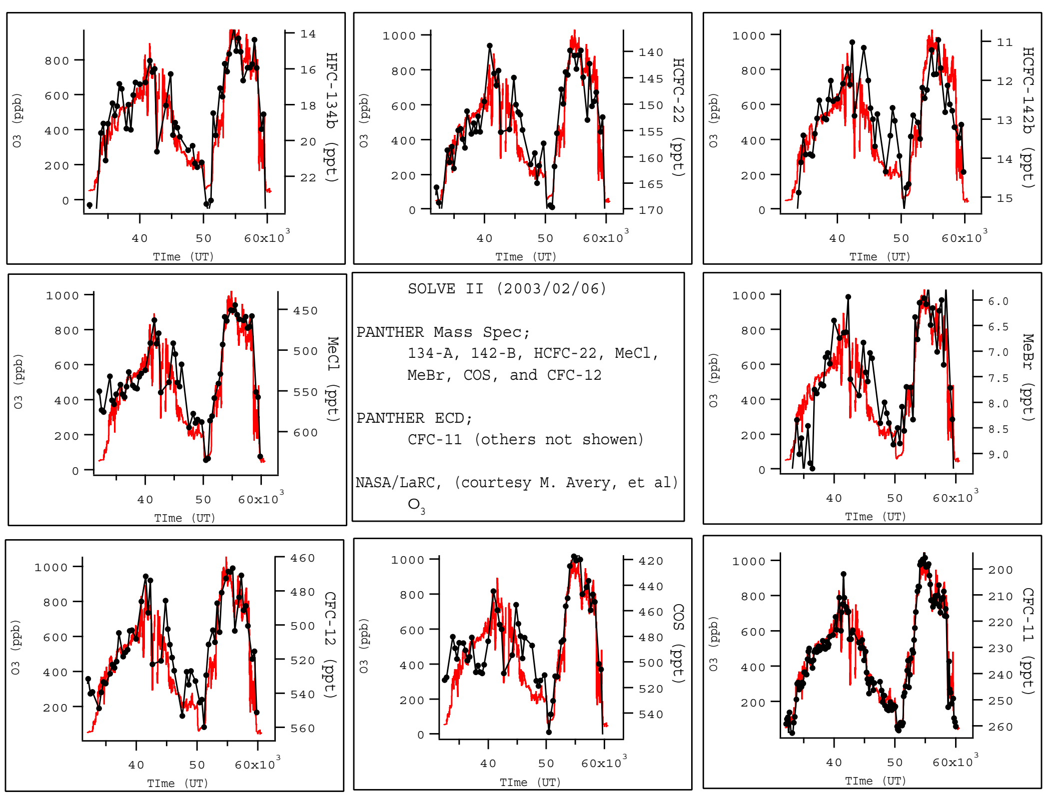

Figure 1. CMDL measurements from the free troposphere and stratosphere using in situ mass spectrometer techniques are plotted in black. Higher resolution ozone data taken simultaneously by the NASA/LaRC instrument (plotted in red) indicates that the majority of the structure through out the flight has been captured. The current data rate for PANTHER's mass spectrometry is twice that shown in these plots.