Expanding Regular Measurements of Halocarbons, Hydrocarbons and Carbonyl Sulfide Vertically through the Troposphere

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Regular measurements of a wide suite of trace gases throughout the troposphere (up to 8 km) began at a number of North American sites in 2004. Useful data from samples collected over the continent were obtained in earlier studies e.g., CO_2 Budget and Rectification Airborne Program (COBRA), but for a fairly narrow suite of gases and only over short periods. These new samples will offer a unique view of continental fluxes over seasonal and interannual timescales of ozone-depleting gases, gases listed in the Kyoto Protocol, gases that are taken up and released by vegetation and soils, and toxic air pollutants. Such an improved picture of continental-scale fluxes will be invaluable for addressing a number of important issues such as: assessing the influence of North American (NA) production restrictions on regional emissions and concentrations; assessing the influence and contribution of NA to global trace gas fluxes; and assessing the role of the terrestrial biosphere on the uptake of carbonyl sulfide and other gases. Furthermore, the results may help constrain continental fluxes of CO_2, for example, by allowing estimates of the anthropogenic input to an air sample, the magnitude of photosynthetic uptake by vegetation, and boundary-layer mixing depths. Initial results (Figure 1) show good consistency with background station data for many gases and a range of vertical gradients. For example, the profiles suggest minimal continental emissions of many ozone-depleting substances, substantial emissions for HCFCs, HFCs, and benzene, and substantial, surface-based uptake of carbonyl sulfide, methyl bromide, and methyl chloride.

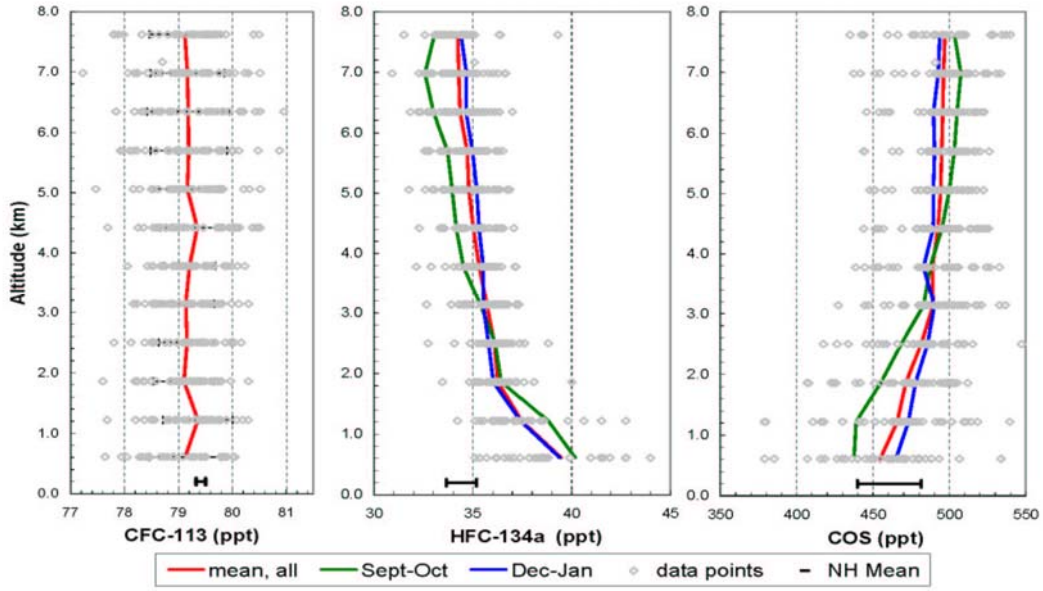

Figure 1. Mixing ratios of an ozone-depleting substance (CFC-113), an alternative for ozone-depleting substances (HFC-134a), and carbonyl sulfide (COS) from flasks filled on aircraft over seven sites in the continental US during late fall-winter of 2004. The northern hemispheric background mean is shown at 0.2 km altitude for comparison. The profiles suggest that continental emissions are minimal for CFC-113 and substantial for HFC-134a, and they suggest the presence of a substantial, seasonally varying surface uptake of carbonyl sulfide.