Preliminary Results from GMD's Halocarbons and other Trace Gases Measurements on ATom

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We have learned a great deal about our atmosphere from the 25 years plus of airborne observations of the halocarbons and other trace atmospheric species on both a regional and global scale. We will have completed four seasonal circuits of the NASA Atmospheric Tomography Mission (ATom). One of the primary purposes of ATom is to study the influence of air quality on climate during all seasons over the Atlantic and Pacific Oceans.

Two ESRL/GMD airborne *in situ* gas chromatographs (GCs), the peroxyacyl nitrates (PAN) and other Trace Hydrohalocarbons ExpeRiment (PANTHER) and UAS (Unmanned Aerial System) Chromatograph for Atmospheric Trace Species (UCATS), and one flask collection sampling system, Programmable Flask Package (PFP), operated on ATom. Data from the first two circuits of over 450 atmospheric parameters are publically available from https://espoarchive.nasa.gov/archive/browse/atom.

As an example, from ATom-2 (Feb. 2017), the altitude-latitude cross sections of sulfur hexafluoride (SF_6) mixing ratios from the **(a)** GCs and **(b)** PFPs are in good agreement. Sources are mostly located in the Northern Hemisphere (NH) (~95%). The upper troposphere indicates inter-hemispheric mixing. At high altitudes in polar regions, older air mixes in from the stratosphere. Using the procedure described by Waugh et al. (2013) and a recent growth rate of 0.32 ppt yr^{-1}, we have calculated the mean age of each SF_6 measurement from its source at ground level in the NH, (lat. range of 30-50°N). The contours of age (**c**) are in agreement with the mean inter-hemispheric exchange time (τ_{ns}) of ~1.2 yr. and higher ages in the polar stratosphere (2-3 yr.).

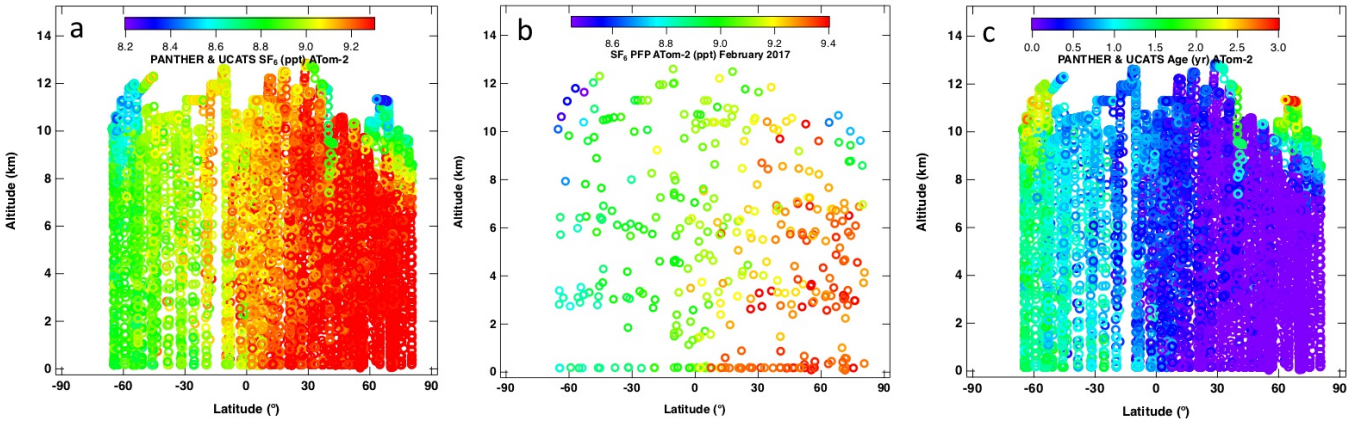

Figure 1. The altitude-latitude cross sections of SF_6 mixing ratios from the **(a)** higher sampling frequency GCs and **(b)** PFPs, and **(c)** calculated tropospheric age of the air mass from NH sources are shown for ATom-2.