Atmospheric Sulfur Hexafluoride Still on the Increase

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Sulfur hexafluoride (SF_6) has been increasing in the atmosphere at ~5% (~0.2 pmol mol^{-1}) per year over the past 7 years (Figure 1). Although it is currently at only 5 pmol mol^{-1}, its growth rate is significant because of its long lifetime (~700-3200 years) and its high global warming potential (GWP). Calculated for 20- to 500-yr horizons, the GWP for SF_6 is 15,000 to 32,000 times that of CO_2, making it one of the strongest greenhouse gases known. Its GWP is much higher than that of any other gas evaluated in recent global assessments, including chlorofluorocarbons, hydrocarbons, and fully fluorinated species. Also, because it is essentially inert below the mesosphere, SF_6 has been a useful tracer for tropospheric, stratospheric, oceanic, and groundwater studies. It derives mainly from its use in insulating high-voltage electrical equipment, such as transformers and circuit breakers.

CMDL has been monitoring SF_6 in the troposphere and stratosphere since 1995. Currently, measurements include analysis of weekly flask samples from 13 sites across the globe, hourly in situ measurements from four CMDL baseline observatories, and annual measurements in the lower and middle stratosphere. We also have begun to include SF_6 measurements of flask samples collected weekly as part of the carbon cycle network, which represents over 50 sites globally. Finally, we have analyzed archived air from Niwot Ridge, Colorado, dating back to 1987, and we have analyzed air in firn (unconsolidated snow) from polar sites in the northern and southern hemispheres. Measurements are all calibrated to a common scale of standards prepared gravimetrically in our laboratory in Boulder, Colorado. This collection of measurements demonstrates that SF_6 in the atmosphere results entirely from human activities of the past century and provides a robust documentation of its global and regional distributions and trends. CMDL surface and airborne measurements of SF_6 are now closely linked, dramatically improving the quality of mean-age determinations for stratospheric air masses.

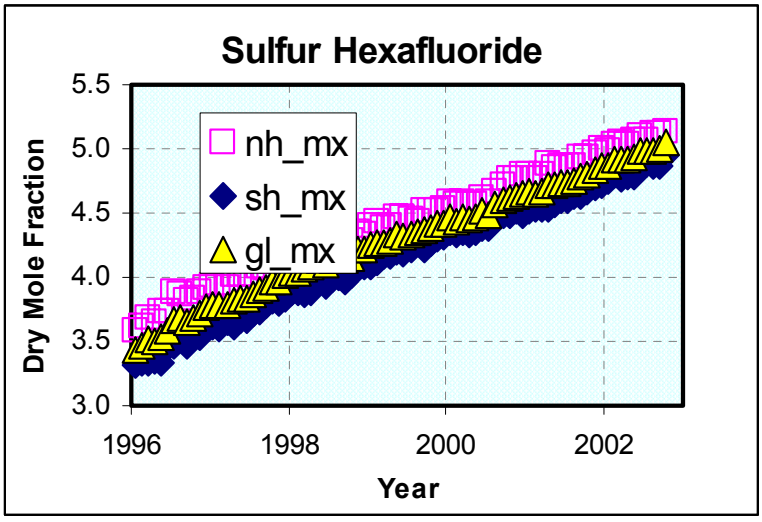

Figure 1. Hemispheric and global distributions of sulfur hexafluoride over the past 7 years. These data are condensed from flask measurements at eight background stations, including the CMDL observatories.