Atmospheric Emissions of Sulfur Hexafluoride: A Challenge for the Future

J.W. Elkins[1], G.S. Dutton[2], B.D. Hall[1], D.F. Hurst[2], F.L. Moore[2], D.J. Mondeel[2], J.D. Nance[2] and E.J. Dlugokencky[1]

[1]NOAA Earth System Research Laboratory, 325 Broadway, Boulder, CO 80305; 303-497-6224, E-mail: james.w.elkins@noaa.gov
[2]Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO 80309

Atmospheric sulfur hexafluoride (SF_6) has become one of the fastest growing minor greenhouse gases since the development of the NOAA ESRL Annual Greenhouse Gas Index (AGGI, base year = 1990). Its total radiative forcing could become a major concern in the near future. On a per molecule basis, it is almost 22,200 times more effective as an infrared absorber than carbon dioxide (CO_2), but its global mixing ratio is much less where global mean mixing ratios are almost 6.5 parts-per-trillion (ppt) compared to 385 parts-per-million for CO_2. It is used almost exclusively as an electric insulating gas for the distribution of electric power. It also has a long atmospheric lifetime, estimated between 500 and 3200 years. Over the past two years, the atmospheric growth rate has accelerated from an average of 0.21 ppt year to 0.31 ppt year. The major problem with dielectric gases used in power distribution is that there is no known environmentally friendly substitute for SF_6. Mankind's demand for electricity over the long term will grow with population. A switch from less fossil fuel technology to more alternative energy sources like wind, solar, tidal action, and biofuels will still require SF_6. This talk will highlight recent observations from NOAA ESRL's flask and *in situ* ground base networks, along with recent airborne regional and global campaigns.

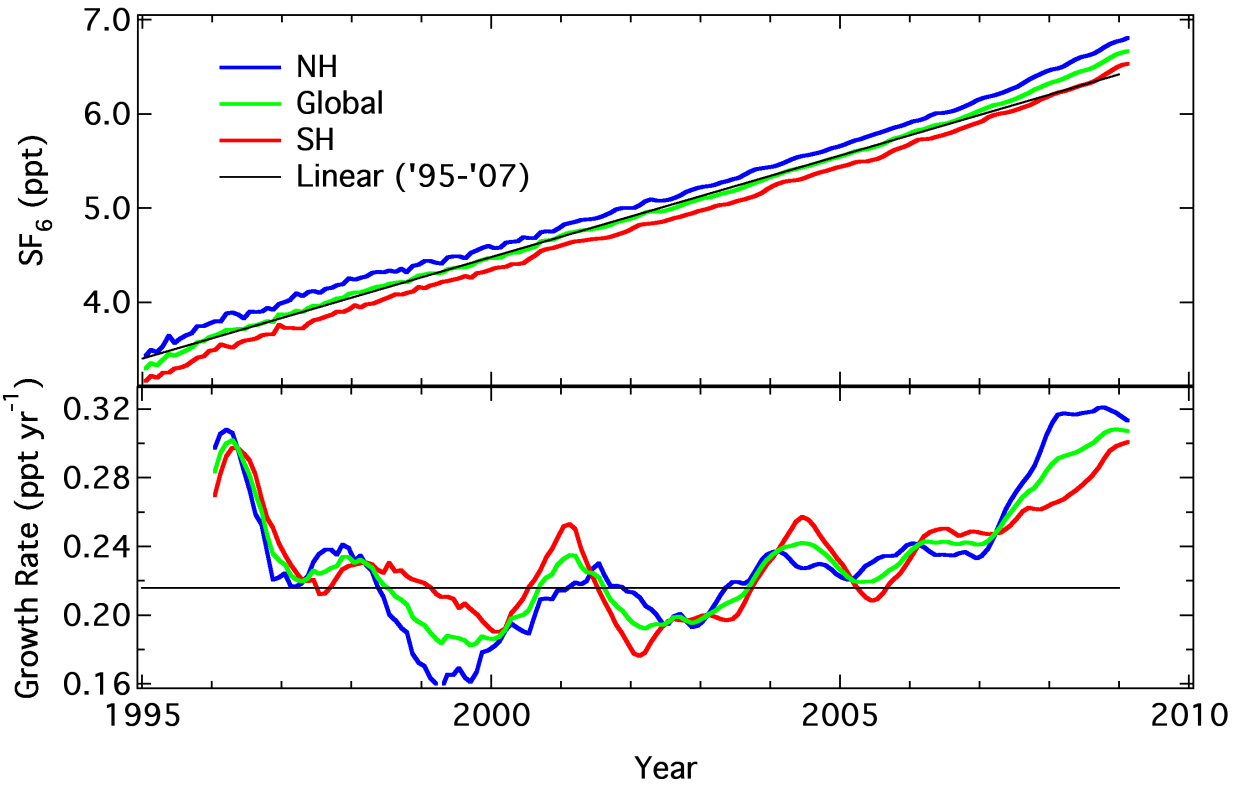

Figure 1. Global and Hemispheric Means of SF_6 (top panel), Respective growth rate, noting clear departure from linear growth in 2007 (bottom panel).