The Global Distributions of N_2O and SF_6

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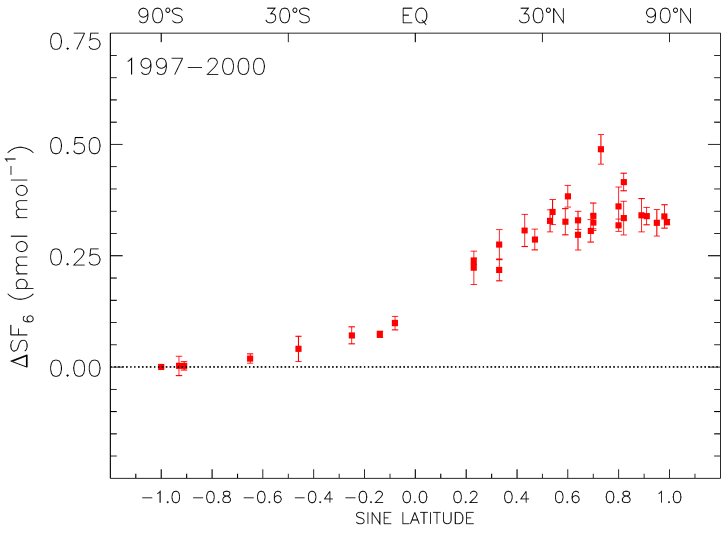
Atmospheric nitrous oxide (N_2O) and sulfurhexafluoride (SF_6) mole fractions in discrete air samples have been determined from ~60 sites by the CMDL Carbon Cycle Greenhouse Gases group since mid-1997. Measurements are made by gas chromatography with electron capture detection (ECD) relative to standard scales developed in the Halocarbons and Other Trace Species (HATS) group. Uncertainties in the standard scales (95% confidence limits) are 0.8 nmol mol^{-1} for N_2O and 0.05 pmol mol^{-1} for SF_6. For N_2O, the ECD response is characterized monthly by a second-order polynomial with a suite of six secondary standards covering the range 242-343 nmol mol^{-1}. An instrument response function prepared from the secondary standards relative to the working standard is used to quantify samples. SF_6 in air samples is quantified with the working standard by assuming a linear response with zero intercept in samples that are free of SF_6. Analytical precision is ~0.2 nmol mol^{-1} for N_2O and ~0.04 pmol mol^{-1} for SF_6.

The measurements impose important constraints on the budgets of N_2O and SF_6. In the figure, differences in annual mean SF_6 mole fractions between each site and South Pole are plotted as a function of latitude. Typical differences between sites at midnorthern latitudes and South Pole are ~0.3 pmol mol^{-1}, indicating that ~95% of SF_6 emission occurs in the northern hemisphere. The mean difference in annually averaged values between Hungary and South Pole is much larger, ~0.5 pmol mol^{-1}, indicating a large European source. A similar latitudinal distribution is observed for N_2O, with typical differences in annual means between South Pole and midnorthern latitudes of 1.3 nmol mol^{-1}, consistent with about 2/3 of emissions occurring in the northern hemisphere. The site in Hungary has the largest difference with South Pole, 2.8 nmol mol^{-1}.



Differences in annual mean SF_6 mole fractions between each site and South Pole as a function of sine (latitude) for mid-1997 to mid-2000. Uncertainties are ±1σ. The annual means for each site were calculated from curves fitted to the data.