Geophysical Research Abstracts,
Vol. 11, EGU2009-8206, 2009
EGU General Assembly 2009


# Trends in stratospheric NO2

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Data of spectrometric ground-based measurements of stratospheric column NO2 contents at stations within the Network for the Detection of Atmospheric Composition Change (NDACC) are analyzed for linear trends. The trend analysis takes into account the NO2 seasonal variation, effects of the 11-year solar and geomagnetic activity cycles, effects of the quasi-biennial oscillation and the El Nino - Southern Oscillation, and the effects of the El Chichon and Pinatubo eruptions. The latitudinal distributions of the annual and seasonal trends in NO2 have been obtained. The annual trends are mostly positive in the southern hemisphere middle and low latitudes and negative in the European sector of the northern hemisphere middle latitudes. In the high and polar latitudes of the two hemispheres, the annual estimates of trends are mostly statistically insignificant. However, a positive NO2 trend is observed at 78°S in the Antarctic, while positive and negative trends are observed in the northern hemisphere high latitudes. The maximum positive and negative trends are about 10% per decade by module. Seasonal estimates of the trends differ generally from the annual estimates. At stations of Zvenigorod, Jungfraujoch (northern hemisphere middle latitudes), Lauder, and Macquarie Island (southern hemisphere middle latitudes) the signs of the NO2 trends do not depend on season, although the trend values vary with season. At other stations, trend values, their statistical significance, and even their signs can vary with season. Nitrogen oxides affects the photochemical balance of stratospheric ozone directly and indirectly, influencing the effectiveness of ozone destruction in the chlorine cycle. The observed significant trends in stratospheric NO2 should result in noticeable perturbations of the rates of ozone destruction in the nitrogen cycle. The sensitivities of photochemical balance of stratospheric ozone to long-term changes in stratospheric NO2 and chlorine are estimated using a combination of analytical and one-dimensional photochemical models.