

Is the Growth Rate of Nitrous Oxide Increasing?

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Nitrous oxide (N_2O) currently exerts the third largest climate forcing of the long-lived greenhouse gases, after carbon dioxide and methane. N_2O is also involved in the destruction of stratospheric ozone. It is produced by microbial activity in soils and oceans, and also by industry. The atmospheric burden of N_2O has increased more than 20% from its preindustrial level of ~ 270 nmol/mol (ppb). Much of this increase is related to the application of nitrogen-containing fertilizers. NOAA/GMD has measured the atmospheric mole fraction of N_2O in air samples collected around the globe (since the late 1970s) and at *in situ* sites spanning the Western Hemisphere (since 1998). The global growth rate of N_2O has varied over the years, but averaged about 0.74 ppb/yr from 2000 through 2010. Since 2011, the global growth rate appears to have increased markedly. We will present NOAA/GMD data and discuss the large-scale features of the N_2O record. We will also explore the N_2O calibration history and possible artifacts that calibration and measurement efforts could impart on the derived growth rate trends.

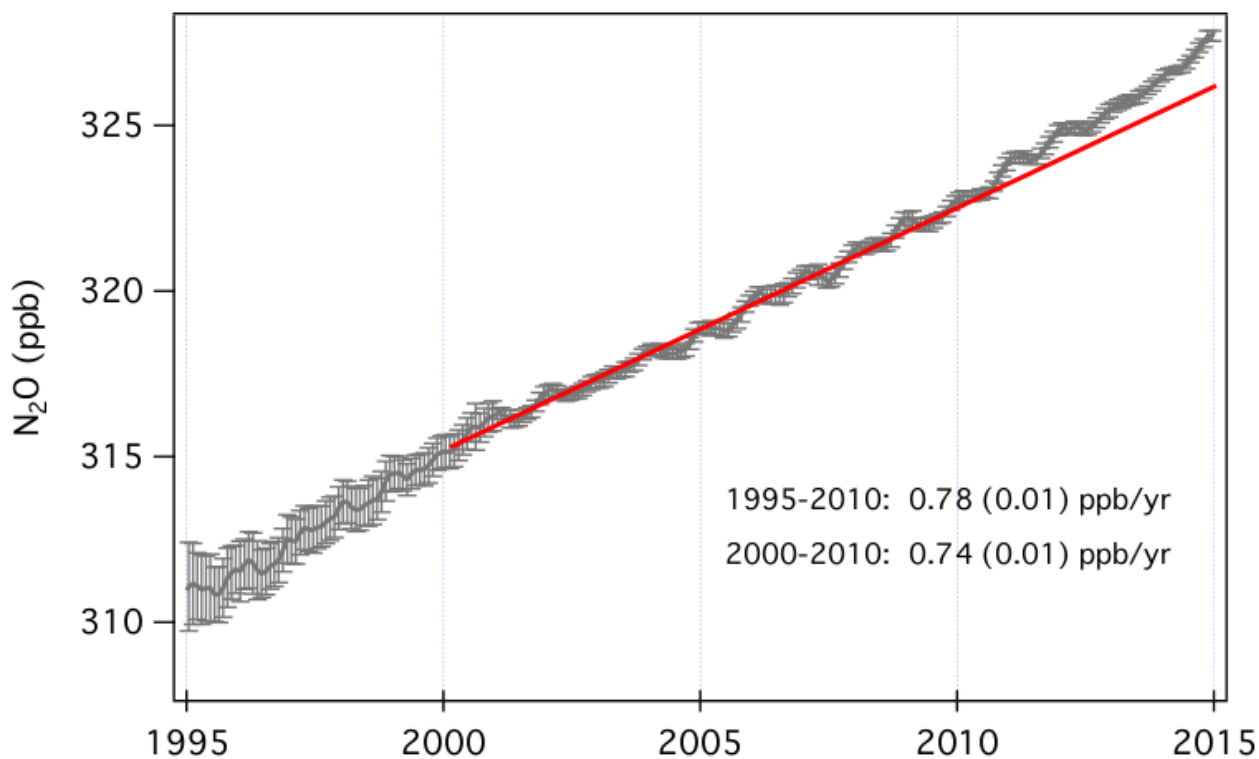


Figure 1. Globally-average N_2O since 1995. The data shown here are global, monthly averages (error bars are approx. 1 std. dev.) derived from multiple measurement programs (glass flasks, metal flasks, and *in situ* data). The red line is a linear fit from 2000 thru 2010 (0.74 ppb/yr), extrapolated into the present decade. Values in parenthesis are 1-sigma uncertainties on the linear fits. Since about 2011, the growth rate of N_2O has accelerated above the 2000-2010 average.