The Increasing Importance of Nitrous Oxide in Climate-Related Research

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Nitrous oxide (N_2O) is a strong greenhouse and ozone-depleting trace gas in the atmosphere. Its mean global concentration is 317 parts per billion (ppb) at the beginning of 2003 (Figure 1). According to the Intergovernmental Panel for Climate Change (IPCC) report in 2001, N_2O is 296 times more effective per molecule over a 100-yr time horizon as an infrared absorbing gas than carbon dioxide (CO_2). It has contributed about 7% of the climate forcing of all greenhouse gases since the beginning of the industrial revolution. N_2O also is the major source of stratospheric nitric oxide (NO). Nitric oxide forms nitrogen dioxide (NO_2) and enters into a catalytic destruction process that destroys stratospheric ozone (O_3). Future chemical model scenarios involving less equivalent chlorine and a leveling off of methane concentrations have increases in N_2O as a significant loss mechanism for stratospheric ozone in this century. The budget of atmospheric N_2O is imbalanced by 30% (sources exceed sinks) as a result of man-made sources. Since 2000, the growth of atmospheric N_2O slowed as a result of a reduction in either natural or manmade emissions or both. Monitoring the future global burden of atmospheric N_2O will be a priority for CMDL. This presentation covers the uncertainties in its budget and prediction of growth for the future, along with implications for climate change.

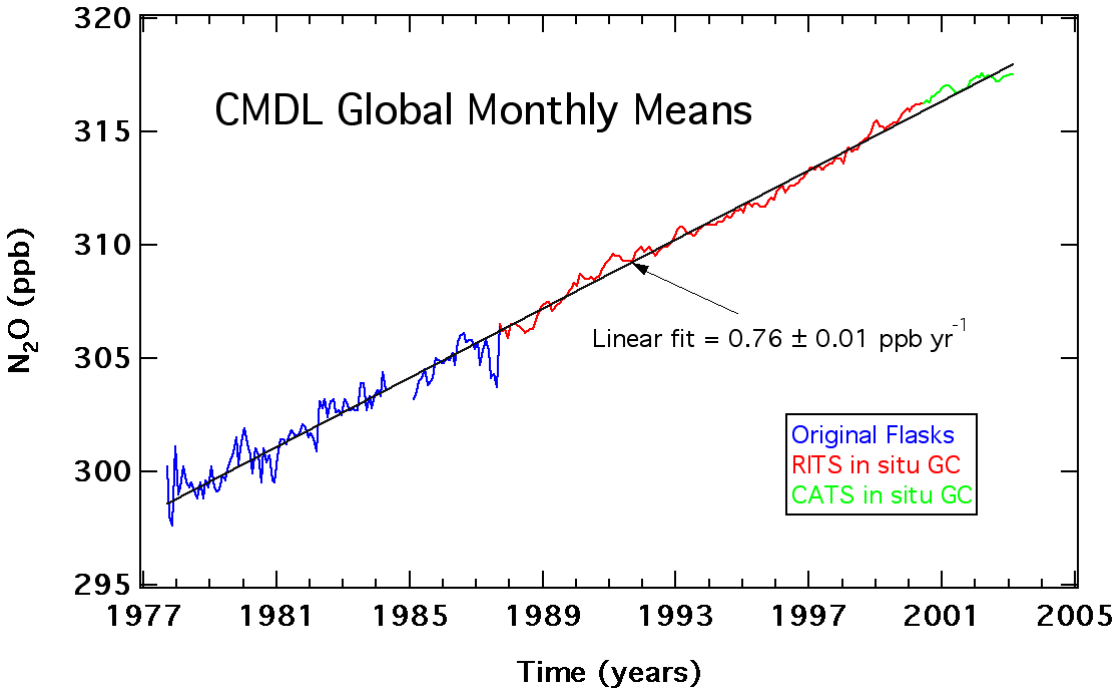

Figure 1. Global monthly mean concentrations of N_2O, 1978-present.