QOS2016-20, 2016
Quadrennial Ozone Symposium of the International Ozone Commission
© Author(s) 2016. CC Attribution 3.0 License.

The changing ozone depletion potential of nitrous oxide in a future climate

L. E. Revell (1,2), F. Tummon (1), R. J. Salawitch (3), A. Stenke (1), and T. Peter (1)

(1) Institute for Atmospheric and Climate Science, ETH Zurich, Zurich, Switzerland (laura.revell@env.ethz.ch), (2) Bodeker Scientific, Alexandra, New Zealand, (3) Department of Atmospheric and Oceanic Science, University of Maryland, College Park, Maryland, USA

Nitrous oxide (N_2O), which decomposes in the stratosphere to form nitrogen oxides (NO_x), is currently the dominant anthropogenic ozone-depleting substance emitted. Ozone depletion potentials (ODPs) of specific compounds, commonly evaluated for present-day conditions, were developed for long-lived halocarbons and are used by policymakers to inform decision-making around protection of the ozone layer. However, the effect of N_2O on ozone will evolve in the future due to changes in stratospheric dynamics and chemistry induced by rising levels of greenhouse gases. Using chemistry-climate model (CCM) simulations with the SOCOL v.3 CCM, we show that despite the fact that NO_x-induced ozone loss slows with increasing concentrations of CO_2 and CH_4, the ODP of N_2O for year 2100 varies under different scenarios and is mostly larger than the ODP of N_2O for year 2000. This occurs because the traditional ODP approach is tied to ozone depletion induced by CFC-11, which is also sensitive to CO_2 and CH_4. We therefore suggest that a single ODP for N_2O is of limited use.