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Effect of future increase in nitrous oxide on stratospheric ozone

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With the successful regulation of halogen containing ozone depleting substances (ODS) in the Montreal Protocol and its amendments, today nitrous oxide (N₂O) is the most important ozone depleting species emitted by anthropogenic activity. The future increase of carbon dioxide (CO₂) and methane (CH₄) however, will have a mitigating effect on the ozone depleting potential (ODP) of N₂O. Thus, the future ozone depletion due to N₂O strongly depends on the emission scenarios of CO₂ and CH₄.

In our study we aim to quantify the contribution from N₂O to the ozone loss under the extreme RCP8.5 scenario at the end of the 21st century when the stratospheric halogen loading will have returned to pre-1980 levels. Based on the analysis of multi-year simulations with the chemistry-climate model EMAC we examine the impact of increasing N₂O on ozone and the feedbacks with greenhouse gas (GHG) induced temperature and circulation changes as well as CH₄ induced changes in stratospheric chemistry. Thus, we aim to understand the future potential of N₂O to harm the stratospheric ozone layer if N₂O is not regulated like the halogen containing ODSs.