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Investigations of the effects of anthropogenic stratospheric ozone on tropospheric OH

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The oxidation capacity or self-cleaning in the troposphere is mainly controlled by the existence of the OH radical. The photolysis of ozone into O(1D) and the subsequent reaction with H_2O is the primary OH production, which is thus tightly related to the local solar UV actinic flux and hence the overhead ozone column. Globally, the main destruction of OH occurs by the reaction with the greenhouse methane, which lifetime itself is controlled by the concentration of the OH radical.
In order to improve our understanding of the effects of anthropogenic changes of stratospheric ozone on the oxidation of the greenhouse gas methane, we perform calculations within the ICON-ART framework and report results of long-term simulations with two model configurations concerning stratospheric ozone: a) without interactive ozone, and b) with linearized interactive ozone schemes. The simulations also include a simplified OH chemistry scheme and the CloudJ scheme for the calculation of photolysis rates. With this chemical configurations of ICON-ART two long-term simulations are performed, one AMIP type simulation and one with increased temperatures in the troposphere by 4 K seen by the chemistry. This set of simulations allows to investigate whether the main influence of stratospheric ozone changes on tropospheric oxidation capacity and hence on the lifetime of CH_4 is due to changes in the actinic UV flux reaching the troposphere or to tropospheric warming.