



Global modelling of upper tropospheric-lower stratospheric iodine: budget and implications for ozone

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Pioneering modelling analyses during the 1990s suggested that photochemical reactions involving iodine could be of substantial importance to ozone loss in the lowermost stratosphere. Since then there have been numerous attempts to observe reactive iodine in the upper-troposphere lower-stratosphere (UTLS) and new photochemical data have become available. Most observational studies, in combination with photochemical modelling, have derived mixing ratios of total reactive iodine (Iy) of around 0.2 pptv in the lowermost stratosphere. According to such analyses and to the latest WMO's Scientific Assessments of Ozone Depletion, it is unlikely that iodinated gases play a significant role in the photochemistry of stratospheric ozone. However the iodine amounts inferred by previous analyses are subject to large uncertainties in the measurement techniques as well as in the kinetic data available for iodine.

Here we present simulations of the global CAM-Chem chemistry-climate model to gain more insight into the role of iodine in stratospheric chemistry at the global scale. CAM-Chem has been extended to incorporate emissions and the photochemical breakdown of very short-lived (VSL) halogenated sources from the oceans as well as state-of-the-art reactive iodine chemistry. The VSL halocarbons treated in the model are five bromocarbons (CHBr_3 , CH_2Br_2 , CH_2BrCl , CHBrCl_2 , CHBr_2Cl) and three iodocarbons (CH_3I , CH_2ICl , CH_2IBr , CH_2I_2). VSL bromocarbons and methyl iodide (CH_3I), with atmospheric lifetimes of months to a few days, can enter the tropical tropopause layer (TTL) through efficient transport within deep convection cells. At the lower boundary, the time-varying (monthly values) zonally-averaged distributions of long lived halocarbons and well mixed greenhouse gases are specified following observational datasets. The simulated mixing ratios of VSL halocarbons have been evaluated by using a compilation of aircraft campaigns in the troposphere and the UTLS. In addition, the loadings of total chlorine and bromine in the model are in line with those of previous analyses.

In this presentation we will show results for a number of reactive iodine species (e.g. IO, OIO, IONO_2 , HI and HOI) as simulated by CAM-Chem to improve the current understanding of the budget and partitioning of iodine in the stratosphere.