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Impact of deep convection and dehydration on stratospheric bromine loading

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Recent studies have shown the importance of bromine very short-lived substances for the stratospheric bromine budget and their potential impact on ozone depletion. In this study, stratospheric bromine loading due to very short-lived substances is investigated with a 3D chemical transport model over a period of 22 years of ECMWF ERA-Interim reanalysis from 1989 to 2010. Within this framework the impact of dehydration and deep convection on the amount of stratospheric bromine is analyzed using an idealized and a detailed full chemistry approach. Included in both modeling approaches are the two most important bromine short-lived substances, bromoform and dibromomethane. This study explicitly investigates the scavenging efficiency of soluble inorganic bromine and the role of heterogenous chemistry in the tropical upper troposphere/lower stratosphere. Furthermore, it illustrates the effect of strong perturbations in convective activity on stratospheric bromine during El Niño seasons. Finally, the impact of the additional bromine on stratospheric ozone is investigated.