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Modelling the chemistry and transport of short-lived halocarbons in the tropical tropopause layer

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Halogenated very short-lived species (VSLS, e.g. $CHBr_3$, CH_2Br_2) of natural oceanic origin provide a source of reactive Br to both the troposphere and the stratosphere. The magnitude of this supply, the relative contribution from each source gas and the mechanism for troposphere-stratopshere transport remains uncertain.

We have used a global 3-D chemical transport model (CTM) to investigate the lifetime, transport and chemistry of Br and I-containing VSLS in the tropical troposphere. We estimate the abundance of these organic source gases in the tropical tropopause layer (TTL) along with their bromine/iodine-containing degradation products. We compare modelled source gas distributions with new aircraft observations in the TTL using various model convection schemes. We also assess the impact of these VSL source gases on the bromine budget of the lower stratosphere.

Our CTM simulations show good agreement with observations for the major VSL halocarbons. The estimated contribution of VSLS to stratospheric Br_y is $\sim$6.5 ppt - larger than our previous estimation. Furthermore, simulations show that "minor" VSLS (e.g. $CHBr_2Cl$, CH_2BrCl) combined may provide a Br supply comparable to the more abundant source gases $CHBr_3$ and CH_2Br_2.