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Investigations of bromine concentration in the troposphere using MOZART4

G. Sousa Santos (1), S. Rast (1), J.-F. Lamarque (2), J. Orlando (2), G. Brasseur (2)

(1) Max Planck Institute for Meteorology, Hamburg, Germany, (2) National Center for Atmospheric Research, Boulder, USA

Since the observation of the Polar Tropospheric Ozone Holes, when ozone concentration levels decrease dramatically, reactive halogen species have been studied in order to understand their role in tropospheric chemistry. We discuss the global spatio-temporal distribution of bromine in our contribution using the global chemistry transport model MOZART4. This model includes a fully interactive sea salt calculation. Our model also includes a detailed bromine chemistry scheme in the gas phase and heterogeneous chemistry on background aerosols. The seasonal variation of halocarbons of natural origin is taken into account. The main sink of bromine species in the troposphere is wet and dry deposition.

Halocarbons are a source of 0.6 Tg (Br)/yr, mainly in the coastal areas and the equatorial region. It results in a global volume mixing ratio of BrO of up to 10^{-3} ppt. This is too low compared to the estimated global concentration of 1-2 ppt BrO. We discuss the contribution of sea salt as the main source of Br_x (inorganic bromine). The highest volume mixing ratios are found in high sea salt formation regions around 58^o latitude on the Southern Hemisphere and in the Northern Atlantic region Southeast from Greenland. The volume mixing ratios produced by the model in this region are in the range of 7-15 ppt Br_x. The ozone concentration levels in these regions are reduced by 6 to 18 $\%$ compared to a model simulation without bromine chemistry.

The BrO concentrations that are produced by the model show that sea salt explains most of background BrO, except at the poles. At the poles, sea salt on sea ice or as frost flowers probably plays the main role. This contribution is discussed.