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Halogen chemistry in the marine boundary layer: first results of a global model study

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We have developed submodels that explicitly calculate halogen chemistry in the atmospheric marine boundary layer within the chemistry climate model ECHAM5/MESSy. One submodel covers the emission fluxes of sea salt aerosol and thus the emission fluxes of halides. Another submodel, MECCA-MBL, calculates explicitly the chemistry in both the gas phase and in aerosols. It also calculates the transition between these phases. Furthermore, the aerosol model M7 was integrated into our model to prognostically calculate the aerosol properties required for the calculation of multiphase reaction rate coefficients. First results show a maximum of BrO over the oceans in the northern hemisphere. This indicates that two prerequisites are involved in halogen activation: First, sea salt emissions are necessary to provide a sufficient bromide source. Second, the abundance of gas phase acids (anthropogenic SO2, HNO3 etc.) is necessary to acidify the aerosol. The combination results in the highest bromine release from the aerosol phase. A comparison of simulations with and without halogen chemistry showed reduced ozone concentrations over all oceans. This confirms that halogen chemistry leads to ozone destruction in remote regions.