Halogen Production from Aqueous Tropospheric Particles

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Halogenation of organics within the atmosphere may occur after production of active halogen species which subsequently react with adequate organic substrates such as unsaturated compounds. Laboratory and modelling studies on aqueous tropospheric particle chemical processes leading to the production of halogen-containing radicals in both the gas as well the condensed phase are described in this contribution. Whereas current chemical schemes for the so-called "halogen activation" mainly focus on a non-radical chemistry in sea-salt aerosols, a coupling towards aqueous phase radical chemistry appears to be possible. Such more complex chemistry may lead to additional pathways of halogen production which do not require especially high particle halide concentrations, low pH or NO_x-rich air masses to lead to significant production of $X\cdot$, X_2, HOX or XNO_2 in both phases and $X_2^{-}\cdot$ in the aqueous phase ($X\cdot$ = Cl·, Br·). Clearly, these halogen-containing species may be involved in oxidation processes which for special substrates may also lead to the formation of halogenated compounds for special cases.

The studies described here include selected laboratory studies the results of which have been used to be implemented into the **C**hemical **A**queous **P**hase **R**adical **M**echanism (CAPRAM) in its Version 2.4 (MODAC mechanism). In the modelling part, the development of a halogen chemistry module is described (HALOGEN 1.2). Results from the study suggest that not only sea salt particles but also marine clouds may foster the production of gas phase halogen compounds by heterogeneous pathways. Different scenarios have been studied for which results are presented.