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Impact of Halogen Species in the Troposphere on the Ozone concentration on the Regional Scale

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In order to quantify the interaction of halogen species with ozone a chemical mechanism was developed. This halogen mechanism handles the most important reactions dealing with halogen species in the gas phase. It is classified into three levels of complexity. The first one includes the basic reaction pathways of reactive halogen species including two catalytic ozone destruction cycles. The second one adds reaction paths concerning halogen species with nitrogen oxides. The last one adds the hydrolysis of halogen nitrates. This most complete mechanism was linked to the gas phase mechanism RADMKA, which already describes the ozone chemistry in the troposphere but so far did not consider halogen species.
Box model runs were used to explore the sensitivity of the ozone concentration to the individual mechanisms and to quantify this impact. A difference of about 5 % in the ozone concentration due to the halogen reactions was found, the hydrolysis reactions contribute the biggest part to this difference.
The halogen mechanism was also included to the model system COSMO-ART (Vogel et al., 2009). The operational weather forecast model of the Deutscher Wetterdienst was extended to treat the chemistry and physics of gases and aerosols. Parameterisations to describe directly emitted components like soot, mineral dust, sea salt and biological material are also included. A spatial and temporal constant source of molecular iodine (I2) was added along the coastlines of Europe. This iodine emission from macroalgal species was taken from the results of the Reactive Halogens in the Marine Boundary Layer Experiment (RHaMBLe), measured in September 2006 in the coastal regions around Roscoff, France (Leigh et al., 2010). Differences in the ozone concentration occur not only in coastal regions but also over the open sea and over land due to transport processes. Results of sensitivity studies with respect to the emissions and the heterogeneous reactions will be presented.