



Chlorine Activation on Cirrus Clouds

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Observations of ClO (HALOX/Geophysica) during the SCOUT campaign in Darwin, Australia in 2005 indicated that a significant fraction of total inorganic chlorine Cl_y was in the form of ClO in the presence of cirrus clouds. For some observations even an almost complete chlorine activation is derived.

We focus on the processes that cause chlorine activation in the presence of cirrus clouds. This is investigated using the chemistry module of the Chemical Lagrangian Model of the Stratosphere (CLaMS) along 10-day back trajectories from the flight path.

Heterogeneous chemistry on the surface of the cirrus particles was included. For this, the heterogeneous chemistry module that had been developed for reactions on stratospheric cloud particles was adjusted. Chains of chemical reactions that are able to explain the observed chlorine activation include these heterogeneous reactions.

The simulations show that almost full chlorine activation in the presence of cirrus clouds is possible. The chlorine activation depends sensitively on ozone and Br_y mixing ratios. Using recommended reaction rates and observed mixing ratios of ozone and NO_y, chlorine activation is not reproduced. However, chlorine-activation is possible within the rather large uncertainty range given by the uncertainty of the underlying important reaction rate coefficients and the cirrus particle surface.