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Twenty years of observation of chlorine activation and ozone loss by ground-based FTIR measurements at Kiruna

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Summary: Since 20 years ground-based FTIR (Fourier Transform Infrared) measurements are performed in Kiruna. Besides long-term trends of atmospheric composition polar processes are studied. This paper will discuss and compare chlorine activation and ozone depletion of different winters. This contribution is an update of the paper by Blumenstock et al., IJRS, 2009, and the oral presentation by Blumenstock et al. at QOS 2012.

In the framework of the NDACC (Network for the Detection of Atmospheric Composition Change) a ground-based FTIR spectrometer is operated in Kiruna (Sweden). From winter 1989/90 to 1995/96 measurements at Kiruna have been performed on a campaign basis. Since March 1996 a Bruker IFS 120HR spectrometer is operated continuously in collaboration with the IRF Kiruna and the University of Nagoya (Japan). From the recorded spectra column amount and profiles of more than ten species are derived: O₃, H₂O, HDO, OCS, N₂O, CH₄, HF, HCl, ClONO₂, NO, NO₂, and HNO₃.

In this paper we will focus on observations made when Kiruna was inside the polar vortex and will discuss chlorine activation and ozone depletion in the polar vortex. Column amounts of HF are used as a dynamical tracer. Using the ratios of column amounts of HCl and ClONO₂ to HF the degree of chlorine activation is determined. In several winters significant chlorine activation is observed. Similarly, the ratio of O₃ to HF is used in order to investigate ozone depletion. These ratios will be discussed and compared with model calculations.