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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Unusually low ozone, HCl, and HNO_3 column measurements at Eureka, Canada during winter/spring 2011" *by* R. Lindenmaier et al.

Anonymous Referee #1

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General comments:

The authors present measurements of ozone, HCl, ClONO2, HNO3 and HF in the polar vortex of winter 20010/11. Since the site Eureka was frequently below the polar vortex a nice data set has been recorded showing chlorine activation as well as ozone depletion in that winter. These data are compared with data from previous winters. Furthermore, data have been compared with SLIMCAT model data. Using these model calculations for passive ozone ozone loss has been quantified for winter 2010/11.

The subject is fully appropriate for publication in ACP. I recommend publication after minor revisions.

Specific comments:

Chapter 1 Intro:

The Solomon et al., 1986 paper is cited on page 1055 and 1056, but is missing in the reference list. In contrast, Solomon et al 1990 & 1999 are listed, but not cited.

Chapter 2 Measurements:

What's the solar elevation angle at Eureka on February, 23?

Is the spectroscopic error included in the error estimate as given in Table 1? Please list the error sources included in the error estimate. A total error of 4.5% for ClONO2 seems to be quite optimistic, except for large column amounts at the polar edge.

Chapter 3 & 4:

How do the Q diagnostics differ from the more frequently used equivalent latitude method introduced by Nash et al., 1996?

Figs. 5 and 6 show data of different winters. While for 2011 polar vortex is indicated for other winters it is not. When comparing 2011 data with data from different winters it is not clear whether the data are taken inside the vortex or not. However, open and full symbols are already used to distinguish between BOMEM and Bruker spectra. Please provide additional information or omit outside vortex data.

When comparing data of different winters did you consider a trend of the species? Maybe you can add a statement on the trends of the species studied, and whether detrending of the data is needed in this context or not.

'However, in 2011, the conversion of active chlorine back into these two reservoirs was simultaneous, differing from the usual repartitioning.': There are just 2 data points (day 86 & 87) which support this statement of Antarctic type of recovery. Slimcat model shows rapid recovery in HCl and ClONO2 around day 80. Unfortunately there are no FTIR observations during this period to compare with.

Last but not least, there is a nice result which is not yet discussed in the paper: Assuming a standard ratio O3/HF of 4000 a column ozone loss of 37.5% ((2500-4000)/4000) is calculated. This is in good agreement with the 35% value as obtained by the more sophisticated method applied in this study: FTIR measurement minus Slimcat passive ozone. Therefore, the simple O3/HF method without applying model calculations, just using the measured data, gives a good estimate of column ozone loss. I would like to encourage the authors to add a short paragraph on this topic.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 1053, 2012.