

Interactive comment on “Diurnal variations of reactive chlorine and nitrogen oxides observed by MIPAS-B inside the January 2010 Arctic vortex” by G. Wetzel et al.

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Response to referee #1:

First of all we thank the referee for his/her effort to carefully reading the manuscript and for all comments and suggestions for improvements.

General comments:

1) To investigate the influence of tropospheric and stratospheric clouds we performed calculations with the TUV5.0 radiation model (S. Madronich, NCAR/ACD, 2010). The outcome of these calculations is that tropospheric clouds and surface albedo do not

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have any significant influence on the photolysis rates of ClOOCl and NO₂. Around sunrise the photolysis frequency is dominated by the diffuse radiation. This is consistent with the findings by Sumińska-Ebersoldt et al. (2012). However, shadowing by polar stratospheric clouds modifies the photolysis rates of these species resulting in a delayed photolysis of these molecules. We modified the text accordingly.

2) We included two figures showing the temporal variation of ClO and NO₂ at the interesting altitudes together with the photolysis rates in dependence of the occurrence of different clouds.

Specific comments:

p. 4871 l. 4:

Modified.

p. 4876, l. 5-8:

The reference Landgraf and Crutzen (1998) is correct. In the paper by Williams et al. (2006), some updates concerning the performance of the band approach for the accurate calculation of online photolysis rates are described.

p. 4876, l. 23-25:

We enhanced the backward trajectory calculations to ten days. However, the statement in the text remains the same. The activation period is more than one week which normally is enough for an almost complete activation. The surface area density in the model is up to $1.2 \text{ E-07 cm}^2 \text{ cm}^{-3}$ at 20 km.

p. 4877, l. 14:

This part of the text has been revised. The corresponding statement is not necessary any more and is now omitted.

p. 4880, l. 9-11:

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At 24 km, the surface area density in the model is $3.0 \text{ E-08 cm}^2 \text{ cm}^{-3}$.

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