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Interactive comment on "Testing our understanding of Arctic denitrification using MIPAS-E satellite measurements in winter 2002/3" *by* S. Davies et al.

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In their study, Davies et al. use the SLIMCAT/DLAPSE model to simulate denitrification of the winter 2002/03. In our similar study (Grooß et al., 2005[1]), also simulations of denitrification for this winter have been shown. We do not show comparisons with MIPAS HNO_3, but we show comparisons with MarkIV as presented by Davies et al., further we show comparisons with in-situ data obtained by SIOUX and HAGAR on the Geophysica aircraft.

[1]Atmos. Chem. Phys., 5, 1437-1448, 2005

1. The comparison with MarkIV is similarly in both studies and the reason for not simulating the re-nitrification is likely caused by the inhomogeneous denitrification field (compare Figure 6 of Grooß et al.). Re-nitrification is clearly simulated by CLaMS around the denitrified area and the MarkIV observation is close to this edge. In the DLAPSE/SLIMCAT figure, there seems to be no obvious re-nitrification. In our study, we state that the sensitivity with respect to the chosen nucleation rate is largest in early winter on December 16. Therefore it is most challenging to reproduce the MarkIV data, both from the time and location of the observation. Ice particles may be the cause of this discrepancy, but it may as well be related to model issues as uncertainties in wind and temperature data or model resolution.

2. It is a very good idea to perform a comparison with ENVISAT-MIPAS HNO_3 on a systematic way. If possible, it would be also nice to see the denitrification derived from Envisat in a similar manner than Figure 1c (as HNO_3-NO_y*). However, when comparing simulations with observed HNO_3, the sequestration of HNO_3 into solid NAT or liquid particles makes it difficult to distinguish between temporary uptake and irreversible denitrification, as the aerosol parameters like number density are not exactly known.

3. It is not clear to me, why the data outside the vortex in Figure 2 do show positive values, that is a re-nitrification. This means that more HNO_3 is observed than NO_y* derived from the correlation with N_2O. Davies et al. state that this may be caused by NAT on ice particles. As those observation seem to be outside the vortex, could it rather be, that the used NO_y-N_2O correlation does not describe mid-latitudes properly?

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 10997, 2005.