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

S. Davies et al.

Received and published: 8 February 2006

1. MarkIV comparison.

We should have stated that the CLaMS model produces renitrification which is in much better agreement with the observations than SLIMCAT/DLAPSE and was a typographical error on our part. We agree with the point made by Jens-Uwe Grooß that reproducing the detail of the MarkIV renitrification on December 16 is challenging due to the time and proximity of the edge of the renitrified zone in the model to the balloon launch location. Such a task is more likely to be successfully achieved in a fully Lagrangian model such as CLaMS rather than the
combined Eulerian/Lagrangian model used in this study. It is worth reiterating that the process of denitrification and renitrification occurs in 3-D space and therefore, for any single profile, it is not necessarily the case that the mass increase due to renitrification balances the mass loss by denitrification.

2. Use of model $NO_y^*$. It would be perfectly possible to compare MIPAS-E denitrification derived from $HNO_3 - NO_y^*$ with similarly derived model denitrification rather than $HNO_3$ - passive $NO_y$ as is done here. To do so would increase the dependence of the outcome on an additional model variable ($N_2O$). In order to do so, in-vortex model $N_2O$ would require initialisation from MIPAS-derived $N_2O$ in the early winter.

3. Positive MIPAS-E $HNO_3 - NO_y^*$ outside vortex. The values shown in Fig. 2 indicate MIPAS-E derived $HNO_3 - NO_y^*$ superimposed on model fields of $HNO_3$ - passive $NO_y$. The weak positive values of MIPAS-E ($\sim 1–2$ ppbv) $HNO_3 - NO_y^*$ are most likely due to to the limitations in the derivation of $NO_y^*$ in the extra-vortex region although we have not fully investigated the MIPAS-E data in the extra-vortex region.

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