

Interactive comment on
**“Mesosphere-to-stratosphere descent of odd
nitrogen in February–March 2009 after sudden
stratospheric warming” by S.-M. Salmi et al.**

Anonymous Referee #2

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General comments:

In this manuscript Salmi et al. investigated the effect of odd nitrogen (NO_x) produced by energetic particle precipitation in the Northern Hemisphere winter with different dynamic conditions (2007 and 2009). They compared the descending NO_x in a chemistry transport model (CTM) to observations from ACE-FTS. The descending NO_x was controlled by dynamics and chemistry only played a minor role in NO_x-loss. They also showed changes in the ozone mixing ratio in the stratosphere which is not due to NO_x descent.

In the last years several discussions about winter NO_x enhancements occurred. This

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paper is a good contribution to these discussions and therefore should be published after a few modifications.

Major comments:

- 1) I completely agree with point 2 of referee 1. I think the paper by Funke et al. (2007) also should be added in the references.
- 2) The parts treating the ECMWF-data up to 80 km have to be revised. You are writing that the ECMWF data is not consistent with observations above 50 km (p. 1433, l. 26) and "all the issues mentioned above might influence the model results"(p. 1434, l. 8). One of your goals was to test the quality of the ECMWF data. Having the statements from before in mind I think you really should do a test, e.g. do the same model run without using ECMWF above 50 km.
- 3) You only have a few observations by ACE-FTS. How are the NO_x mixing ratios distributed at the model upper boundary? Uniformly or longitude/latitude dependent? Within the polar vortex or northward of 60N? How big is the uncertainty in the results due to the assumptions made for the UBC?
- 4) Satellite data always have a limited vertical resolution. Observed mixing ratios therefore can be lower than the real ones. Is this considered in your measurement error? If not: How big is the influence of vertical resolution for NO_x observations by ACE-FTS?

Minor comments:

1. Figure 6 and figure 7 have different color scales. Please use same color scale for better comparability
2. Figure 6: NO_x; Figure 7: NO; I guess both show NO_x?
3. Figure 9: loactions → locations
4. page 1431, line 29: spelling: "enchancement" → enhancement

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References:

Funke, B., M. López-Puertas, H. Fischer, G. P. Stiller, T. von Clarmann, G. Wetzel, B. Carli, and C. Belotti (2007), Comment on "Origin of the January–April 2004 increase in stratospheric NO₂ observed in northern polar latitudes" by Jean-Baptiste Renard et al., *Geophys. Res. Lett.*, 34, L07813, doi:10.1029/2006GL027518.

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