We would like to thank the reviewer for taking the time to read this manuscript, and for offering suggestions for improvements. Below, we provide a list of responses to the reviewer's points. The relevant citations for this response are listed in the references section at the end.

1) lines 7-12, page 7984 We have now corrected this to refer to the "3-D microphysical model studies of Arctic denitrification: comparison with observations" paper by Davies et al. 2005.

2) line 22, page 7996: Observations during the RECONCILE campaign showed that around 80% of the aerosol observed in the polar vortex contained non-volatile residuals (Von-Hobe et al 2013), while Murphy et al. 2007 report fractions of aerosol containing meteoritic material of between about 30% and 70%, depending on altitude above the tropopause (the data reported in Murphy et al. are however not polar vortex measurements). Curtius et al 2005 report around 70% of aerosol particles containing non-volatile residuals within the polar vortex. The fact that non-volatile residuals are found in the aerosol indicates that the meteoritic particles remain solid. As there is a large range in the fraction of aerosol containing meteoritic material, and there are no measurements available for the specific trajectories used in our modelling study, we decided on a fraction of 50%. This is however not a critical parameter in our NAT nucleation parameterisation. Other values could be used, and would produce the same results once the parameterisation is re-tuned. As described in the paper, only a small fraction of the meteoritic material present can act as NAT nuclei, if the observations are to be reproduced, and this fraction is determined by the three parameters, alpha, gamma prime, and P_pre. We have added the following text to the section describing the model:

"Measurements reported by Curtius et al. (2005) show that during January to March 2003 approximately 67% of aerosol particles in the Arctic polar vortex contained non-volatile residuals, while outside the vortex the value was much lower at approximately 24%. Similar values (between 30% and 70% depending on altitude above the tropopause) are reported for meteoritic particles in aerosol by Murphy et al. 2007, for mid to low latitudes. During the RECONCILE campaign, values of up to 80% were found. The value used here, of 7.5 cm^{-3} aerosol particles containing foreign nuclei, corresponding to 50% of the total aerosol, was chosen as a conservative estimate. As discussed below, only a small fraction of these nuclei actually participate in the NAT nucleation, therefore only choosing a far lower percentage would have any effect on the results."

3) Section 2.4, page 7997 We have now added a table to the introduction, summarising all the volume based rates (as well as those derived from lab measurements) that we are aware of. In section 2.4, we now refer to this table, rather than citing all the previous papers again.

4) Figure 3: This has been done, as suggested.

5) Figure 6 caption:The reviewer is correct, these contours refer to the temperature below Tnat. We have now changed the figure captions to reflect this.

Technical points:

1) line 9, page 7986 Corrected.
2) Section 2.2.1, page 7988:This section is useful to provide an overview of the whole model, therefore we have left it here.

References:

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Murphy, D. M., Cziczo, D. J., Hudson, P. K., and Thomson, D. S.: Carbonaceous material in aerosol particles in the lower stratosphere and tropopause region, J. Geophys. Res., 112, doi:10.1029/2006JD007297, 2007.

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