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Interactive comment on “Heterogeneous formation of polar stratospheric clouds – Part 1: Nucleation of nitric acid trihydrate (NAT)” by C. R. Hoyle et al.

Anonymous Referee #2

Received and published: 8 May 2013

This manuscript details the development of a parameterisation of heterogeneous nucleation of NAT in PSCs, its implementation in a box model, and applies this model to the study of several PSC formation events during the 2010 Arctic winter (comparing the results to both measurements and to those produced using a constant homogeneous nucleation rate). It is the first part of a 2 part series of papers, the second dealing with the heterogeneous nucleation of ice particles.

The parameterisation presented reproduces the satellite measurements of PSCs reasonably well, and is certainly better than the results obtained using a constant nucleation rate. It is a useful contribution to the area of research and I recommend that the

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manuscript is published, following minor corrections detailed below.

Specific points:

- 1) lines 7-12, page 7984 (and reference on page 8008): The Davies et al. (2005) paper that you reference here is on developmental work on the dynamical core of the UM, not on Arctic stratospheric denitrification. Please could you provide the correct reference?
- 2) line 22, page 7996: What do you base the number density of foreign nuclei on, and what is the sensitivity to this assumed number density?
- 3) Section 2.4, page 7997: Please could you provide references here (not just in the introduction) for the previous studies which have used similar constant nucleation rates?
- 4) Figure 3: The aerosol categories on this, and possibly on subsequent similar plots, should be labelled for clarity (and so that the paper is reasonably self-contained).
- 5) Figure 6 caption: The contour lines in the top three panels appear to show the difference in temperature compared to T_NAT, rather than the absolute temperature. The caption of this (and subsequent) figures should be corrected to reflect this.

Technical points:

- 1) line 9, page 7986: averaging, not averageing
- 2) Section 2.2.1, page 7988: Is this section necessary for this paper - would it not be better left to the Part 2 paper covering ice nucleation?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 7979, 2013.

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