

Interactive comment on “Modeling the Frozen-In Anticyclone in the 2005 Arctic summer stratosphere” by D. R. Allen et al.

Anonymous Referee #2

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This article examines the formation and evolution of a frozen-in anticyclone (FriAC) advected from the low to the high latitudes in the northern hemisphere, between March and August 2005. While, this particular frozen-in anticyclone had been observed by the MLS instrument and modeled by a chemical transport model in Manney et al. (2006), this article describes in great detail how the FriAC life-cycle is reproduced by three newer models of various complexity. These models range from a high-resolution one-layer isentropic model to a full CTM. The study and its conclusions should be quite useful to stratospheric modelers. The paper is well-written, and deserves to be published in ACP, provided the minor comments below are addressed. The paper is a bit lengthy at times, and the number of figures is rather high. The authors should consider reducing the number of figures; I can only suggest two figures that are not really necessary, namely Figs. 1b and 8.

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Minor comments

1) P8, line 28: why do the authors consider that PV is noisy at 1300K, on APR 4? High PV remnants of the polar vortex are seen at all levels above 850K. Isn't that simply the case that this level is above the top of the FriAC?

2) P12, line 18: should be figure 3, not 4 (?).

3) P13, line 28: I don't understand why the authors say that the feature is not always identified by anticyclonic circulation. I can see that in the initial formation period (APR 1-7), the FriAC progresses eastwards. But it is still an anticyclone. Please clarify.

4) P17, line 26: the authors say that the elevated N₂O in MLS on August 30 and 90E is not the FriAC last stage, but a new feature. Wasn't that feature already visible at earlier dates? Please relate the final evolution of the FriAC in July-August more clearly with what is seen on the maps of Fig. 15

5) P20, line 19: it could equally be said that the MLS sampling and limited resolution degrades the filaments present in the real world, and that VITA has more realistic filamentation processes (?)

6) General. What determines the depth (or vertical extent) of the FriAC ? Is it linked to the depth of the initial low-latitude intrusion?

Wording Caption Fig. 3: there are no white lines, only black lines. I don't understand why the caption indicates geopotential only at 10 hPa ?

Caption Fig. 17: *lines*. They are several lines

Caption Fig. 18: define E/Up in full in the caption.

Caption Fig. 14: more vertical tick marks are needed on the y-axis. Indicate latitude.

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