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Interactive comment on "Stratospheric temperatures and tracer transport in a nudged 4-year middle atmosphere GCM simulation" *by* M. K. van Aalst et al.

Anonymous Referee #1

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Review of 'Stratospheric temperatures and tracer transport in a nudged 4-year middle atmosphere GCM simulation', by M. van Aalst et al.

This is a well written, somewhat technical paper about an important subject in current atmospheric research. Apart from several technical comments, I have one main specific comment, which is that the results of this study might be interpreted more in the context of stratosphere-troposphere coupling (see below). If these comments are considered in a revised manuscript, I recommend the manuscript for publication in ACP.

Specific comment ——————

If the GCM with a troposphere-only nudging succesfully simulates an aspect of the stratosphere, then, I would say, this aspect is driven by the troposphere, and is not due to internal stratospheric dynamics. I would welcome more interpretative remarks throughout the paper on this subject. Although the focus of the study is perhaps rather technical ("i.e. seeing whether the troposphere-only nudging gives a realistic stratosphere"), I suggest to discuss where possible the results in the context of the dynamics of the atmosphere, particularly in the context of stratosphere-troposphere coupling. For example, what does the very realistic tape recorder of the model (nice result!) learn us from the importance of the (nudged) tropospheric waves for the tropical stratospheric upwelling? What tells it about the quality of the modeled stratospheric processes, such as gravity wave drag?

Other specific comments ————————

Figures 1,3,7,8,9 are not sufficiently clear. According to the caption the colored dahed lines are the 33 and 66 percentiles, but these seem to be the thin solid lines. In addition, the black dashed lines mentioned in the caption in reality seem to be the coloured dashed lines. The captions should be made consistent with the figures (or the figures with the captions, which is even better: it is difficult to discriminate between the three solid colour lines). Other point: are these results zonal mean results? (if yes, please mention in the captions; same point for figs. 12 and 13)

Table 1: this table should also contain the results for 89 hPa (with larger values) (the whole table could perhaps also be removed)

p.970, l. 23: I would not use the term "small" for the cold bias; the difference in area fraction at 89 hPa is at some times more than 100 %.

p.971, l.5: Mention in the text the figure to which the described results apply.

p.973, l.5: also in the run without nudging the difference between model and analyses is very small, so it is difficult to conlude that the nudged run provides a "much closer"

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match. I suggest to quantify the differences, e.g. by computing the mean absolute value of the difference between model and analses, both for the nudged and the not-nudged run.

p.982, l. 1:"reflecting ...." is somewhat vague. Does the author mean that in the northern hemisphere an important part of the stratospheric state is determined by the stratosphere itself?

Tecnical comments ——————-

p.963, l.10 "the a": either "the" or "a" p.966, l.27: what is the standard deviation of the applied bell shape, and is this a realistic value? p.968, l.23: "2" must be "2 10ˆ-6" p.969, l.11: "converge" must perhaps be "coverage"? p.975, l6: 'too" must be "to" p.975, l.9: "midlatitudes between 120 and 360": I don't understand this; why expressing midlatitudes in terms of longitude? p.980, l.1: "show" must be "shows" p.980, l.4 'However...': this sentence should be rephrased

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 961, 2005.