

Interactive comment on “Nitrogen compounds and ozone in the stratosphere: comparison of MIPAS satellite data with the Chemistry Climate Model ECHAM5/MESSy1” by C. Brühl et al.

Anonymous Referee #3

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This paper presents a discussion and comparison of a nudged chemistry-climate model with observations. This is a subject appropriate for Atmospheric Chemistry and Physics, however, I would like to see a bit more analysis of discrepancies between model and observations. Furthermore not all the figures are necessary. I think this manuscript will be suitable for publication in ACP with major revisions along the lines of what I outline below.

In particular Fig 3 & 4 do not really say anything that is not already in Figure 1. Perhaps NO_x and NO_y could be added to Figure 2 to show the vortex. If anything: the shifting zero line on the scales in figures 3 and 4 make interpretation very difficult. I am not

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sure these plots are necessary.

Figure 6 is never really discussed. Figure 5 could probably just show scatterplots with a 1:1 line. The PDFS are hard to read.

It would be nice to also show a longer model climatology against Observations (maybe monthly means), which would help understand things more than just a few days. For example: are the biases in meteorology with the SH subtropical edge persistent, or just for this one event (which is extreme, because it occurs during the ozone hole.). This could be done with MIPAS data over an entire month for example, or maybe 2 months other than september for a few species.

Also, further sensitivity studies to understand the chemical differences should be discussed: in particular, the comment is made on fig3 column pointed to either horizontal resolution or Solar zenith angle effects. This should be easy to sort out by plotting differences v. delta latitude and differences v. Solar zenith angle.

I'm not sure about conclusions about "more lab work". The N2O5 bias appears to be regional. From figure 3 for example. Is this a time issue? Or is it latitude, SZA problems noted above? More analysis here would be helpful.

Minor Points:

1. Abstract " 10 years simulation for 2002-2004"? I think you mean 1995-2004. Also, you never discuss the 10 years of simulation, only 2 days, so this is misleading (see comment above: including some monthly or annual means would be helpful).
2. Pg 1 column 2: Define 'CCM' as Chemistry-Climate Model. Note that your model is NOT coupled (off line dynamics). Or is it 'partially coupled' above the relaxation levels ($P < 200\text{hpa}$)?
3. Pg2, column 1, 1st paragraph: can you provide a reference for the non-LTE retrievals?

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4. Pg 2, section 4.1: Please discuss results of more than 3 days for better context.
5. Pg 3 column 1: N₂O₅ differences " effects of the different horizontal resolution or problems with photolysis" as noted, you should be able to determine this with a plot of N₂O₅ differences v. solar zenith angle and v. horizontal separation.
6. Pg3 section 4.3: not sure you need to show both Figure 5 and Figure 6.

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