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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comparison of CMAM simulations of carbon monoxide (CO), nitrous oxide (N_2O), and methane (CH_4) with observations from Odin/SMR, ACE-FTS, and Aura/MLS" *by* J. J. Jin et al.

J. J. Jin et al.

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Reply to Referee #1:

—— First we want to express our thanks for the comments and suggest, and we apologize for the delay of this modification.

The paper provides a useful comparison between a model and three satellite datasets. However, much of the information in the figures is illegible because of the size of the figures. Some of these figures are redundant (2,6,9). The information in figures (1,4,7) might be clearer if the observational fields were plotted as anomalies from the model

fields. If this is an effective solution, figures (3,6,9) might also be considered redundant. The conclusions are mainly about what has been done and the level of agreement. It would be nice to see some science conclusions: has the comparison led to an increased understanding of the physics and chemistry of the atmosphere?

—– We agree with comment on the figures from both of the referees and cut the figures and panels in this modification. We removed the Figures 2, 5, and 8. As to the Figures 1, 4, and 7, we removed the panels for January and October and only show the distributions in April and July, so that the discussion is not sacrificed. We opted not to show the latitude-pressure cross-sections of ratios of observations/CMAM because we think the distributions of the model results and measurements are more useful for readers. However, we do include five ratio profiles at various latitudes and months to demonstrate the quantitative difference between model results and measurements. Moreover, referring comments from the Referee # 3, we also removed the Figures 12 and 15, and cut the panels in the Figure 14. Correspondingly, the text has also been significantly modified.

—– We think this comparison gives a thorough evaluation of the transport of this broadly used model, and it gives us and other researchers including the model community and observation community more confidence to use this model or compare other models" results or observations with this model"s result. In addition, the good capability of the model indicates that the current understandings about the middle atmospheric processes are correct. Although there are not any brand-new scientific understandings, therefore, we think this paper is of interests to a broad range of readers.

p13072, l10: "generally agrees well": please be more precise.

—– This is an introduction sentence, more detailed discussion follows. Anyway, we changed it to "As will be shown in the paper, the CMAM can reproduce the measurements in the stratosphere and mesosphere quite well".

p13080, l14: add "though ratios upto 2 occur at high latitude and altitude", or words to

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that effect.

—– We removed this discussion on the ACE-FTS sampling issue, and refer it (in the revised version, Section 3, paragraph 7) to the discussion version of this study.

p13080, l20: "suggesting": this is shown more clearly in figure 4.

—– In order to shorten this paper and focus on the CMAM evaluation, we removed this paragraph on inter-comparison of the observations.

p13081, l12: "decrease ... destruction by OH": do the authors agree with the suggestion in Juckes (2007) that the decrease in CH4 in the mid-stratosphere in this time period is due to descent?

—– We agree with that after calculating the local chemical lifetime from CMAM and the discussion has been corrected.

Juckes (2007) also shows an autumn minimum in the upper stratosphere CH4 (March in the southern hemisphere, October in the northern hemisphere): it is suggested that this is due to air descending from the mesosphere. It is possible that the different interpretations may reflect the different air masses: the current paper considers latitude bands, Juckes (2007) discusses an equivalent latitude band. One commonality with Juckes (2007) is the small local minimum in CH4 that occurs in the upper polar stratosphere in the fall at around 2hPa.

—– We think the difference between the geographic latitudes and the equivalent latitude is neglectable during this period, summer to early fall.

p13090, l2,3: The phrase "tape-recorder" is most appropriate for fields in which the full field shows an upward propagating feature. The use of the phrase for anomaly patterns dilutes the intended clarity of meaning: the annual oscillation in the CO anomaly fields clearly reflects a competition between advection, diffusion and chemical change, where as the Mote et al. water vapour tape recorder

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—– We continue to use the CO anomaly here. The features shown in anomalies may differ from that shown in volume mixing ratios, but it would not have a significant difference. In addition, Schoeberal et al (2006) also used anomalies to demonstrate the CO "Taper recorder".

p13095, l22: "which is": should be "which are".

—– It is corrected.

p13096, l4: "Despite that": Please correct the language.

—– It is changed to "Although ...".

showed the dominance of vertical advection. I would encourage the use of the alternative phrase, "annual oscillation", when talking about anomaly fields.

—– We changed the "tape recorder" to "annual oscillation".

p13091, l13: presumably the difference could also be due to the lack of vertical gradient in the mean CO field in the mid-stratosphere.

—– We agree that it can be a factor. Since Figure 15 has been deleted, however, we also removed the discussion of this part.

Figure 14, caption: "mean anomalies": You need to explain more clearly, in the caption, what the anomalies are relative to and what averaging is used to produce the mean. E.g. "Anomaly from the zonal mean, averaged over years".

—– We explain the caption (of Figure 10 in the revised version) more clearly: "Multi-year average of the tropical CO anomalies of MLS (panel A) and CMAM (panel B). The anomalies are the daily zonal means minus annual zonal means."

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 13063, 2008.

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