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Interactive comment on “Comparison of CMAM simulations of carbon monoxide (CO), nitrous oxide (N₂O), and methane (CH₄) with observations from Odin/SMR, ACE-FTS, and Aura/MLS” by J. J. Jin et al.

Anonymous Referee #1

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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?

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p13072, I10: 'generally agrees well': please be more precise.

p13080, I14: add 'though ratios upto 2 occur at high latitude and altitude', or words to that effect.

p13080, I20: 'suggesting': this is shown more clearly in figure 4.

p13081, I12: 'decrease ... destruction by OH': do the authors agree with the suggestion in Jukes (2007) that the decrease in CH₄ in the mid-stratosphere in this time period is due to descent?

Jukes (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, Jukes (2007) discusses an equivalent latitude band.

One commonality with Jukes (2007) is the small local minimum in CH₄ that occurs in the upper polar stratosphere in the fall at around 2hPa.

p13090, I2,3: 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

p13095, I22: 'which is': should be 'which are'.

p13096, I4: 'Despite that': Please correct the language. showed the dominance of vertical advection. I would encourage the use of the alternative phrase, 'annual oscillation', when talking about anomaly fields. p13091, I13: presumably the difference could also be due to the lack of vertical gradient in the mean CO field in the mid-stratosphere.

Figure 14, caption: 'mean anomalies': You need to explain more clearly, in the caption,

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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".

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