**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "The impact of orbital sampling, monthly averaging and vertical resolution on climate chemistry model evaluation with satellite observations" *by* A. M. Aghedo et al.

Anonymous Referee #2

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General comments:

The paper addresses important aspects of comparing remote sensing data with model data. The problem is well formulated, and methodology is sound. However, the abstract does not clearly summarize the results. Figures are too small to decipher letters and numbers – need to be enlarged by a factor of 2. Several specific but relatively minor comments need to addressed before the paper can be accepted for publication.

Specific comments:

1. An earlier paper (Luo et al, 2002) on influence of TES orbital sampling on comparison with models should be mentioned in the introduction as it basically outlines the

approach used in the present manuscript. Also, it is interesting to compare the present results based on 2005-2008 data with those early estimates from Luo, M., R. Beer, D. J. Jacob, J. A. Logan, and C. D. Rodgers (2002), Simulated observation of tropospheric ozone and CO with the Tropospheric Emission Spectrometer (TES) satellite instrument, Journal of Geophysical Research, 107(D15), 1-10, doi:10.1029/2001JD000804.

2. P 9713, l 18-22: Need to address effects of quality filtering and missing point due to clouds and other factors on sampling size. This will even further reduce the number of points used in computing averages in this paper, thus increasing σm even further.

3. P 9716, l 6: It is not clear whether authors computed zonal mean of percentage error by correctly summing up the absolute errors and then dividing the result by the sum of the measured column values or, in fact, they directly averaged the percentage errors. The results depicted in Figs 4a, 5a, and 6a could be quite different depending on which method has been used. This needs to be clarified or (if done incorrectly) addressed.

Technical corrections:

1. P 9713, l 4-5: How can the averaged monthly data be used for addressing spatial sampling? This is what a reader might ask when reading these lines. In fact, only in P 9714, l5,6 one can read that the 3-hour output data have been used? Please describe what model data are used in the beginning of section 4, otherwise it is very confusing.

2. P 9713, l 15: It is not clear what temporal resolution model data have been used. See my tech comment #1.

3. P 9713, l 24: It makes sense to mention that a visible spatial pattern in Figure 2 is due to TES 26-hour sampling.

4. P 9714, l 4: What is "raw model output belonging to the grid-box?" Most likely, it is a number of model data points belonging to a grid box that is equal to the number of model time steps in a month.

5. P 9714, l 11: The statement "Ng < N" might be not true in general for other sensors.

For TES it is true due to poor spatial sampling.

6. P 9716 l 3-5: This statement is superficial here as the limited TES spatial and temporal coverage is well known, so the statement can be dropped. How the authors suggest to increase the coverage of a nadir-looking instrument?

7. P9718, l l 7-10 and l 14: Eq 15 and the second line of Eq 16 can be dropped. The derivation of the last line of Eq 16 is straightforward from Eq 14.

8. P 1920, l 23: Sentence starting with "If" is incomplete.

9. Fig 3: The panels are too small – they need be much bigger. It is very difficult to distinguish grey lines and mean values. Instead of repeating the lat/lon information on each panel, it would be better to show a legend for symbols somewhere on the plot.

10. Fig 5a: change "first column" to "left column" and "second column" to "right column".