Atmospheric
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Discussions

ACPD

**Interactive
comment**

Interactive comment on "Upper tropospheric CO and O$_3$ budget during the Asian Summer Monsoon" *by* B. Barret et al.

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Reply to reviewer 1:
We first thank Reviewer 1 for his suggestions to improve our paper.

Comment 1:
One overarching comment is that I personally disliked papers that include numerous figures with many small panels ('postage stamps'), for which the reader is expected to scrutinize details in each of the panels. Figures 1,2,3,5,6,7,13 and 14 are such figures in this paper, showing detailed evolution of various diagnostics during May-October. I would recommend an alternative methodology of showing one or two key months in each of these figures, with enlarged scale to allow focus on the important details.

The seasonal evolution can be described in words, and the entire sequence could be included in Supplementary material if necessary.

We agree with the reviewer: the panel plots contain too many panels which make them unecessarily heavy. Nevertheless, in order to make the monsoon impact on the composition clear, we need to show more than one or two months. For the general context and the model validation with IASI (Fig. 1, 2, 3, 5, 6, 7), we have chosen to keep 3 months out of 6: May (pre-monsoon), July (monsoon) and October (post-monsoon). The plots show very different structures that are important to see on 2D plots. For the budget plots (Fig. 11, 12, 13, 14), we have kept June, July and September to show the evolution during the monsoon itself. As August is very similar to July we have eliminated the August plots. The results from the whole monsoon period are still summarized in Table 2.

Comment 2:
One detail that I don't understand regards the appearance of the 'S-shaped' ozone profile in the GCxAvK calculations, which don't appear in the GC model itself (Fig. 6). I don't understand this because the averaging kernels are broad in the vertical (6-8 km), and so how can they introduce narrow vertical structure into the weighted model results? Is this possibly due to the a priori profiles that are also used in the calculations?

The O3 profiles are naturally S-Shaped in the tropics through the effect of convection which reduces the UT concentrations. The convolution with the AvK accentuates the S-Shape by reducing even more the concentrations in the tropical UTLS as seen in Fig. 6. As mentioned in the text this effect has ben discussed in Dufour et al. 2012 with comparisons between IASI and ozonesondes. The effect is not narrow as the reviewer mentions but spans the whole tropical UT from 400 to 200 hPa (8 to 12 km,

Fig. 6, panels b, e, h) in agreement with the width of the AvK (6-8 km).

Comment 3:
Correlation coefficients are often quoted in comparing IASI vs. model results. Do these refer to spatial or temporal correlations?

They refer to spatio-temporal correlations for the data plotted in Fig. 1 (CO) and 5 (O3) concerning UTLS columns monthly averaged and gridded (for IASI) on the GEOS-Chem grid. Now that we have elliminated 3 out of the 6 months shown in these figures we have modified the text accordingly.
"The statistics of the CO UTLS columns comparison (for the domain displayed in Fig. 1 and the 6 months from May to October) are summarized in Table 1"

Comment 4:
There are numerous English errors in the text that should be corrected. Also, Fig. 10 is called out before Fig. 9.

The text has been proof-read by a native speaker profesionnal in proof-reading and translations of scientific publications. We hope that most of the errors are gone! Figures 10 and 9 have been reordered.

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Discussion paper