

## ***Interactive comment on “The response of the equatorial tropospheric ozone to the Madden–Julian Oscillation in TES satellite observations and CAM-chem model simulation” by W. Sun et al.***

**Anonymous Referee #1**

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This study shows the importance of modeling the MJO for accurate simulations of tropospheric ozone, especially in the tropics. Given the role of tropospheric ozone as a greenhouse gas, understanding the processes that control its distribution is critical to improving climate models. The results of this paper represent an important advance in quantifying the role of the MJO on the distribution of ozone and I think it should be published in ACP after minor revisions.

Comments: The data analysis section (p. 16093) is very short and does not “stand

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alone”. Although references are cited, it would be useful to have more details of how the data are sorted into the 8 phases of the MJO and their significance. Perhaps include a table with the RMM indices, a brief description of the main features of each phase, the model-data correlations and significance (both O<sub>3</sub> and precip.), and number of data points included. For p. 16094, line 6, the average number of TES observations per lat/lon bin should also be stated.

p. 16094, line 18 (Fig. 1): I do not see a maximum at 30°E in the TRMM precip. data as stated in the text.

p. 16095, line 15: This is the only mention of GEOS-chem – seems like non-sequitor.

Minor comments:

p. 16086, line 17: (Abstract) “The ozone anomalies” should be “The model ozone anomalies”

p. 16087, line 28: “Arctic (north of 30°N)” sounds strange – do you mean northern mid-latitudes? Maybe just give the actual lat/lon ranges.

p. 16088 line 9: I would not use the word “advanced” - too subjective. I would say “more precise” here and in line 12 say “Apart from using satellite observations with finer vertical resolution in the troposphere, . . .”

p. 16090 line 17: 0.025 cm<sup>-1</sup> resolution is only for the TES limb mode, which was not used here, and could be misleading. Also, the nadir footprints for the global survey are not in a swath and are averaged over 16 pixels, so that horizontal resolution is 5.3km x 8.5 km for the retrievals. I would say “TES nadir observation have 0.1cm<sup>-1</sup> spectral resolution and a horizontal footprint of 5.3km x 8.5km.”

p. 16093 line 1: should be “a priori profiles and the averaging kernel matrices”

p. 16098 line 13: “In Fig. 6. . .” should be Fig. 5?

p. 16100 lines 15 & 17: instead of “model data” use “model simulations”

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p. 16101 line 3: “With the lightning on the model-simulated ozone. . .” I think this should be: “With the lightning turned on, the model-simulated ozone. . .”

p. 16103 line 13: “coefficient as 0.84” do you mean with a correlation coefficient of 0.84 or as high as 0.84?

p. 16105 line 10: “ Yet most chemistry transport models. . .” doesn’t follow from the previous sentence – maybe just say “Most chemistry transport models. . .”

p. 16111 line 24: Worden et al 2004 reference cited relates to TES limb data (not used). Should be: Worden, J., S. S. Kulawik, M. W. Shephard, S. A. Clough, H. Worden, K. Bowman, and A. Goldman (2004), Predicted errors of tropospheric emission spectrometer nadir retrievals from spectral window selection, *J. Geophys. Res.*, 109, D09308, doi:10.1029/2004JD004522.

Fig. 1 caption: does right axis have precip in mm/day? (state in caption)

Fig. 4 caption: dashed/solid vs green/red not consistent for left/right panels. Caption should also state that vertical panels correspond the 8 MJO phases.

Please check that axis labels are large enough for print version – too small in ACPD.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 14, 16085, 2014.