We very much appreciate all the comments from Referee #1. Below are the point-to-point responses. For clarity, we underlined the comments from the referee followed by our responses.

The data analysis section (p. 16093) is very short and does not "stand 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 O3 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.

We agree with this reviewer that more details of the data analysis section are needed. In the revised paper we have replaced p. 16094 line 1 to line 6 with:

"and the leading two EOFs explain 25% of the variance of these fields. This daily index characterizes the state of the MJO in terms of its amplitude and phase, where the latter divides the MJO cycle (typically about 40–55 days) into 8 phases, each roughly lasting about 6 days. Phase 1 represents developing positive rainfall anomalies in the western Indian Ocean, with the sequential progression to Phase 8 corresponding to the eastward propagation of positive rainfall anomalies across the eastern Indian Ocean, Maritime Continent, western Pacific, and onto the central/eastern Pacific Ocean (Hendon and Salby, 1994). In this study, composite MJO cycles of interested quantities, such as rainfall and O3, are produced by separately averaging together all daily anomaly values of the given quantity for each phase of the MJO, considering only strong amplitude events where $RMM2^1 + RMM2^2 > 1$. We restrict our analysis to the North Hemisphere (boreal) winter months (November to April) from 2004 to 2009 because the MJO signal is stronger when the Indo-Pacific warm pool is centered near the equator. When performing the model and TES comparison, we binned the data into 20 latitude (10N-10S) X 10 longitude bins to have sufficient daily data. The number of TES observations per lat/lon bin ranges from 0 to 8 per day and the average number of observations for all the bins of the 10S to 10N area is approximately 1-2 for each day."

Two tables of the spatial correlation coefficients of model and observation ozone and precipitation corresponding to Fig. 4 and 5 are attached.

Table 1. Longitude-latitude (30S-30N) spatial correlation coefficients between modeled and measured ozone and precipitation anomalies, correlated for each phase of the MJO between CAM-chem and TES tropospheric ozone column (324 points) and CAM-chem and TRMM precipitation (4608 points). All correlation coefficients pass student′s-t test at 95% confidence level.
table

Phase	Ozone	Precipitaion
1	0.565	0.759
2	0.676	0.775
3	0.699	0.789
4	0.725	0.765
5	0.614	0.782
6	0.632	0.763
7	0.710	0.727
8	0.641	0.740

Table 2. Longitude-height (surface to 100 hPa) spatial correlation coefficients between modeled and measured ozone anomalies and longitudinal correlation coefficients between modeled and measured precipitation anomalies, correlated for each phase of the MJO between CAM-chem and TES tropospheric ozone column (936 points) and CAM-chem and TRMM precipitation (144 points). Fields are averaged from 10S to 10N. All correlation coefficients pass student′s-t test at 95% confidence level.

Phase	Ozone	Precipitaion
1	0.779	0.940
2	0.603	0.973
3	0.616	0.975
4	0.696	0.965
5	0.676	0.979
6	0.524	0.976
7	0.400	0.957
8	0.802	0.910

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

We agree with the referee that the local maximum at 30E was found only in the model data but not in the TRMM data. We deleted “30E” at p. 16094 line 18, and added, “A local maximum of precipitation at 30E was found only in the model simulation but not in the TRMM data.” after this sentence at p. 16094 line 19.

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

We agree that the comparison with GEOS-chem does not fit here, and we add “The CAM-chem simulated ozone concentration with TES operator applied (Fig.

1b) is consistent with simulations using GEOS-Chem (Bowman et al., 2009).” at the end of this paragraph.

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

Manuscript changed.

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.

North of 30N is denoted for “the northern extra-tropics and the Arctic”. We have deleted ‘(north of 30N)’ to avoid confusion.

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, …”

We agree and changed the sentence to:
“Thus, satellite tropospheric ozone data with finer vertical resolution in the troposphere will better refine the impact of the MJO on tropospheric ozone. In addition, model simulations also provide an essential tool in understanding how the MJO influences tropospheric ozone.”

p. 16090 line 17: 0.025 cm-1 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-1 spectral resolution and a horizontal footprint of 5.3km x 8.5km.”

Manuscript changed.

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

Manuscript changed.

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

Manuscript changed.

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

Manuscript changed.

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

Manuscript changed.

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

We mean a correlation coefficient of 0.84, and the manuscript is changed.

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

Manuscript changed.

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.

Reference replaced in the manuscript.

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

Yes, stated 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.

Manuscript changed to “Left: Composite life cycle (phase 1 to 8) of the MJO-related total tropospheric column (s) ozone (color shades, in DU) for CAM-chem (with the TES operator applied) with precipitation (lines, green as positive and purple as negative); Right: Composite life cycle of the MJO-related TTC ozone for TES (color shades, in DU) with TRMM precipitation (lines, green as positive and purple as negative) for 30S to 30N. The precipitation is contoured from -3 to 3 mm/day with 0.5 mm/day interval.”

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

We will change the axis labels for better presentation.