Below are the point-by-point responses to all the comments from Referee #2. For clarity, we underlined the comments from the referee followed by our responses.

Page 16088, lines 6-11: These sentences imply that TES measurements are better for evaluating MJO variability in tropospheric ozone than other satellite measurements, but this may not be true for several reasons: (1) poor horizontal coverage – TES measures only along nadir orbital positions (i.e., ~14.6 longitudinal measurements per day on average), (2) lack of cloudy scene measurements – TES IR cannot detect tropospheric ozone in the presence of clouds (unlike MLS) which are prevalent in the tropics, and (3) poor vertical resolution – TES has broad vertical resolution for retrieving ozone profiles (section 2.1 notes that this is about 6 km on average for 30-900 hPa). Because of broad vertical resolution TES cannot well separate ozone in the troposphere from ozone in the stratosphere in vicinity of the tropopause (TES is worse at doing this than residual techniques such as from OMI/MLS). The sentences should be either deleted or re-worded regarding these points.

We have reworded these sentences at p. 16088, lines 9-12 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.

Page 16094, line 1: The analyses use the EOF methodologies of Wheeler and Hendon [2004] for the RMM indices and the eight defined phases of the MJO. Wheeler and Hendon [2004] applied these techniques to OLR and zonal winds in the troposphere, but it is not clear how their methodologies are actually applied in the present paper for tropospheric ozone. You might describe a bit more regarding this. RMM1 and RMM2 if I am correct are the two MJO indices (with near-zero correlation between them) derived from the two leading EOFs. Wheeler and Hendon [2004] ascribe about 25% total variance of intra-seasonal OLR/winds to these two leading components.

The referee correctly points out that Wheeler and Hendon (2004) relied on an EOF analysis of OLR and zonal winds to derive the RMM indices for the MJO. However, we did not apply the EOF analysis to the tropospheric ozone. We are interested in how the tropospheric ozone responds to the dynamical changes associated with the MJO. For this reason we just sorted the filtered ozone anomalies (we have removed the annual cycle and band-pass filtered the ozone anomalies as described in the text) into 8 different MJO phases using the RMM indices derived by Wheeler and Hendon (2004)'s EOF analysis.

We agree with the reviewer that that more details of the data analysis section would be welcome. 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^o latitude (10N-10S) X 10^o 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."

Page 16094, line 5: You might mention that 10S-10N with 10 degree longitude intervals results in 36 grid points for the EOF analysis yielding 36 eigenvalues/EOVs/EOFs (or is this not correct?).

We did not perform the EOF analysis ourselves, but sorted our ozone data into 8 MJO phases following the EOF analysis of Wheeler and Hendon.

Was there a specific reason not to use 15S-15N as by Wheeler and Hendon [2004]? Does including latitudes beyond +/-10 degrees for tropospheric ozone result in too much extraneous signals in the EOF analysis to resolve MJO variability?

As demonstrated by Wheeler and Hendon (2004) and many other studies (e.g., Yang et al., 2008; Waliser et al., 2009; Tian et al. 2011), this MJO composite technique based on the Wheeler and Hendon (2004) RMM indices can be applied to any latitude band. We also plotted the signal for 15S-15N, and the comparison with the signal of 10S-10N shows high similarity. Therefore, we decided to use the signal of 10S-10N, which gives a cleaner picture.

It is also not clear how the EOF methodologies were actually applied to arrive at Fig.4 for total tropospheric column (TTC) which shows a much larger latitude range from 30S to 30N.

As demonstrated by Wheeler and Hendon (2004) and many other studies (e.g., Yang et al., 2008; Waliser et al., 2009; Tian et al. 2011), this MJO composite technique based on the Wheeler and Hendon (2004) RMM indices can be applied to any latitude band. We simply composited the ozone anomalies according to the RMM indices developed by Wheeler and Hendon (2004). It is clear that in many cases the ozone signal is coherent across a much larger latitude range than used to identify the RMM indices by Wheeler and Hendon (e.g., Li et al., 2012; 2013).

Page 16098, lines 10-14: You note that Tian et al. [2007] did not find substantial MJO variability in total column ozone in the tropics even though there is a sizable MJO signal in tropical TTC in your current work. (You mention this discrepancy even in the Abstract.) Could the reason for this discrepancy be that Tian et al. [2007] extended the EOF analyses to latitudes +/-40 degrees (i.e., too much cross-talk between too many grid point time series in the EOF analysis?),

We do not think so. Tian et al. (2007) did not use the EOF analysis on the total column ozone, but did use the EOF analysis on tropical rainfall so as to identify the MJO events.
As the referee noticed, in the abstract, we state: "Our analysis indicates that the behavior of the Total Tropospheric Column (TTC) ozone at the intraseasonal time scale is different from that of the total column ozone" emphasizing the differences between the examining the total column or the tropospheric column." As a result, the results in the current paper and Tian et al. (2007) are different but they are not contradictory with each other.

or could it be caused by stratospheric ozone variability from equatorial Rossby waves, mixed Rossby-gravity waves, Kelvin waves, etc.? These stratospheric disturbances will induce some amount of intraseasonal variations in stratospheric column ozone which will complicate detection of the MJO in tropospheric ozone from the total column ozone measurements. By using TES measurements of tropospheric ozone you largely bypass these problems involving stratospheric ozone variability when compared to Tian et al. [2007].

It is certainly true that stratospheric ozone variability can mask tropospheric variability when examining the variability of the total column but this is not the reason for the difference we described in the abstract.

Also, shouldn't line #13 refer to Fig. 5 with observed TES measurements rather than Fig. 6?

Thanks to the referee for correcting the typo. We replaced Fig. 6 with Fig. 5 in the manuscript.

The MJO analysis in your paper only includes EOF results – plotting actual time series of TTC in the Indian Ocean/western Pacific region (i.e., region of peak MJO) is simple to understand and would illustrate directly the peak-to-peak variability associated with the MJO (possibly 5 DU or larger?). Is it possible to include a figure of non-filtered and/or band-pass filtered time series of TES TTC and model TTC simulations for this region? This new figure might be placed in the manuscript before or after the Fig.4 discussion.

We thank the referee for the suggestion of plotting the actual time series. We have included such a figure in the revised manuscript. Peak to peak variability of total tropospheric ozone anomalies is approximately 4-5 DU as surmised by the referee.

A paragraph is inserted in the manuscript before Sect. 4.1 at p. 16097 line 25 as below: "The region (45E-100E,10S-10N) over the Indian Ocean is chosen to look at the MJO-related tropospheric column ozone anomalies time series (deseasonalized 30-60 day bandpass filtered) from Nov 2004 to Jun 2009. The correlation of the CAM-chem simulated and TES observed tropospheric column ozone anomalies is 0.8, which is significant at the student's test 95% confidence level. The peak-to-peak variability reaches up to 4-5 DU, suggesting that MJO is an important process influencing the equatorial tropospheric ozone column."

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