REVIEWER #2

General Comments:

This paper describes a long-term record of monthly mean cloud ozone in the tropics derived from OMI/MLS measurements. It is derived from the residual between OMI ozone above convective clouds and MLS stratospheric ozone. As the OMI cloud pressure is often in the middle of clouds and the physical cloud tops often reach the tropopause, the derived residual ozone generally therefore represents ozone inside clouds, difficult to be measured otherwise. The OMI/MLS cloud ozone is also compared with cloud ozone derived from OMI alone using the ensemble cloud slicing. The spatiotemporal distribution of cloud ozone is discussed in contrast with background ozone. The analysis shows persistent low ozone in the tropical Pacific and higher ozone over landmass regions and connections with ENSO, intra-seasonal/Madden-Julian oscillation variability and boundary layer pollution. This study is suitable for publication in AMT. It is well logically organized. Overall, I recommend it to be published after addressing the following minor comments.

Specific Comments:

1. L115, do you mean OMI V3 as V8.5 is for the OMTO3 algorithm not for all OMI products

We now inserted a sentence to clarify that v8.5 is the actual retrieval algorithm for the OMI ozone.

2. L251, the sentence “The panels in Figure 4 : : : ozone (asterisks)” is redundant with the first sentence and can be removed.

We had a typo – the parentheses in the first sentence should have been singular stating as “panel” rather than “panels”. The third sentence states that OMI/MLS residual cloud ozone is represented by the thick curve and ensemble cloud ozone is represented by the asterisk curve in each of the two panels.

3. L267-269, you may add something to explain the larger uncertainty, e.g., due to the sparseness of clouds as indicated by much fewer derived ensemble cloud ozone in this region

Done.

4. Last paragraph of section 3, is the OMI/MLS cloud ozone product derived on the daily basis? If not, mention monthly mean and the grid cell for averaging. Briefly mention that it is limited to 30S-30N and explain why.

These are excellent points… We have now clarified the use of daily measurements that were then averaged monthly in the first paragraph, and also the final two paragraphs

that descry be the OMI ensemble method and OMI/MLS residual method. We mention at the end of section 3 why we limited to 30S-30N regarding noise issues.

5. L286-290, please mention the enhanced ozone over the Pacific/Atlantic Ocean at latitude closer to 30S/30N.

Good point. We have now included discussion of the observed cloud ozone concentrations over ocean in this paragraph.

6. L292, it is good to define "background" here, i.e., by adding "(near clear-sky scenes with radiative cloud fractions less than 30%)"

Another good point… Done.

7. In last paragraph of section 5, is it contradictory between saying "STE accounts for <5% of ozone over tropical Atlantic" around L299 and "stratospheric ozone contribution is the most important factor for driving the IAV of upper tropospheric ozone : : :" around L308? Please clarify it.

Thanks for catching this – although both Sauvage et al. (2007) and Liu et al. (2017) examined the tropospheric ozone over the tropical Atlantic, Sauvage et al. (2007) focused on the source contribution of tropospheric annual-averaged ozone budget. In contrast the Liu et al. (2017) conclusion was focused on the source contribution of ozone IAV during the austral winter season in the middle and upper troposphere, of which there are large ozone changes due to STE. We have rewritten the text to make this clear.

8. In Figure 8 and L335-345, it is useful to add correlation between aerosol index and cloud ozone over Southern Africa

Done.

9. L356-360, any other speculation for the relatively low cloud ozone around 2010-2012?

It could instead be related partly to ENSO decadal variability (e.g. Nino 3.4 plotted in following Figure 9 for the east Pacific) but that is also speculation. We would really need a longer record and a comprehensive stratosphere-troposphere photochemical transport model to attempt to explain.