We thanks to the reviewer for the time taken for read the new revised Manuscript. In the following, we address the last comments of the reviewer and the changes made to the manuscript accordingly.

L332 reads: "The vertical distribution of CESM-MAM7 simulations shows a quite remarkable agreement with ACE-FTS observations above 400 hPa." Does this refer to Fig. 1e? If so, in my opinion agreement starts at altitudes above 150hPa. At 400hPa the simulation considerably differs from the observations, which could indicate an issue with the parameterization of convective transport (detrainment?; convective altitudes?). Furthermore, Fig. 1e is for one snapshot in time only. I recommend to discuss simulated vertical profiles in comparison to ACE-FTS based on temporal averages, or -better- a statistically meaningful number of snapshots like Fig. 1e. I find Fig. S1 much more of a meaningful comparison, but it is hidden in the supplement and MLS lacks resolution.

Yes, we refer to the comparison of the vertical distribution in Fig 1e. The reviewer is right, the model and ACE-FTS observations are in agreement only above the 200 hPa level. As a result, so we have changed "above 400 hPa" to "above 200 hPa" in the revised Manuscript.

The reasons for the differences between observed and modelled CO with respect to altitude are still unclear and we have discussed this issue in the next paragraph in the manuscript "The discrepancies observed between simulated and observed CO could be linked to the treatment of convection by CESM1/CAM5 together with discrepancies in emission inventories (see discussion above)."

The convection in CESM-MAM7 is parameterized using the Zhang-McFarlane scheme (Zhang and McFarlane, 1995) for deep convection and the Hack scheme (Hack, 1994) for shallow convection (See L243:249 in the revised manuscript). This is a typical parameterization used in numerous studies involving the CAM5 (or previous versions) model.

As answered to reviewer 2 and accordingly modified in the revised manuscript, only a few ACE-FTS profiles are available each year in the AMA (and even less within our 20-35°N/60-105°E box) due to sparse sampling and presence of clouds. This sampling is too limited to derive a robust averaged CO profile and to do subsequent statistically significant analysis. For this reason we have

added in the supplementary material a figure showing a comparison between MLS profiles and the model, and the corresponding discussion (see L:348:352).

We prefer to leave this comparison with MLS in the Supplemental material. Firstly, due to the coarse vertical resolution of MLS which limits the interpretation in term of convective (detrainment altitude, top of cloud level) and secondly because the main objective of the paper is to show the results of our simulations in terms of composition and trend of aerosols in ATAL.

L339: under predictions -> underestimations
Changed

L341: over predicted -> overestimated
Changed

L747: Given the rather loose connection between observational and simulated world in this study, the authors might consider a more cautious formulation here. Something like:
"A double-peak vertical structure … so far. These observations support our simulation results, which in turn provide a possible explanation for the observations. Given the uncertainties discussed throughout the paper, it is not entirely clear whether the simulation is right for the right reasons, but it provides hypotheses for follow-up studies."

We thanks for this comment and we agree with this formulation recommend so we have modified it in the manuscript as follow:

"This "double-peak" vertical structure has been observed in recent balloon and aircraft campaigns (e.g. Vernier et al., 2018; Höpfner et al., 2019) but has not been discussed in detail so far. These observations support our simulation results, which in turn provide a possible explanation for the observations. Given the uncertainties discussed throughout the paper, the ability of our simulations to represent the reality of the convective transport in the ASM is not entirely clear but the model results provide hypotheses for follow-up studies."