RESPONSE TO REVIEWER 2

We would like to thank the reviewer for the insightful and helpful comments and suggestions. The response to each comment is below in italics.

General Comments:

It should be reiterated throughout the text which lidar system (old vs. new) is being described. Although the subscript "_UR" is used to denote the old system, I still found several instances confusing as to which lidar data was presented.

The structure of the article is changed to make it clearer along the text.

Figure 1: Recommend adding ECC, LIO3T, and LIO3t_UR to the map after site location. Also altitude site altitude would be helpful.

Figure 1 now indicates were the used instruments are located. Table 1 gives coordinates and altitude of the sites.

Figure 2: The VR and uncertainty are effectively presented in Figure 6/7 for the new instrument. The information in Figure 2 could be simply stated in the text at various altitudes or added as a component to complement figure 6/7. Or conversely, bring in the new lidar VR/Uncertainty budget here as well to simultaneously show the absolute uncertainty as well as improvement to the system.

VR and uncertainties are now provided for both systems on Figures 3 and 4, respectively.

Figure 3: It would be useful to add the occurrences (with a different color) for the new system. It is stated later in the text and elaborated in Figure 14, but may make more sense to have towards the beginning to complement the old lidar system. Conversely, you could move all of the lidar/ECC discussion to the end (where Figure 14 currently exists).

The article outline is modified and the ECC, LIO3TUR and LIO3T climatologies are given and discussed Section 5. Moreover, Figure 10 is now more consistent with Figure 11 and gives the monthly distribution of the number of profiles for ECC, LIO3TUR and LIO3T.

Section 2.2 and Figure 4: Does the missing data (e.g. December above 10 km) in bottom panel Figure 4 correspond to lack of lidar coverage? Or the uncertainty of the measurement was larger than a certain threshold?

We have only one December profile measured by LIO3T for the 01/2013-01/2016 period, and this profile ends up at 10km due to a misalignement of the lidar. It is stated page 11 lines 5-6.

It would be helpful to recreate the occurrences in Figure 3 as the same layout as Figure 4 but monthly instead of yearly.

Figure 10 is now more consistent with Figure 11 and gives the monthly distribution of the number of profiles for ECC, LIO3TUR and LIO3T.

Generally the ECC shows higher ozone between 10-16 kms, regardless of time of year. Is this a known issue? Relevant to sonde reprocessing?

The ECC climatology is now done with the reprocessed ECC database (Witte et al., 2017) and with a correction applied to take into account the non-standard ECC/solution pairing (cf. Section 4.1). As a result, these greater ozone concentrations between 10-16km previously pointed out by ECC do not appear anymore.

and more importantly, are these differences within the uncertainty of the lidar measurement (with a set vertical resolution/temporal averaging)? A difference plot may highlight potential differences.

The goal of this paper is not to validate LIO3TUR measurements, and ECC and LIO3T measurements are compared (for LIO3T validation) in Section 4.1 for both Gillot and Maïdo soundings with a better accuracy in the comparison than the one that would be obtained from a plot of the difference between two climatologies.

Is the ECC climatology only from Gillot or combination of Gillot/Maido?

Figure 11 only shows Gillot climatology.

Figure 6: Are the differences observed between 6-8 km geophysical or based on the algorithm/processing? Is there a sounding for this observational period to compare with? I would assume the SNR to be largest from 6-8 kms and therefore the temporal averaging would generate less obvious differences. Is it possible there is a partial overlap or saturation correction that needs to be addressed?

The differences are geophysical and unfortunately no sounding is available during the period. Anyway, we decided to remove this figure as it does not bring any information with respect to the scope of this article, which is not to analyse any case study.

L25 – Remove “5The”

Corrected.

Figure 7: Are these uncertainties explicitly based on the retrievals performed in Figure 7 or are these average uncertainties over many nights. It seems odd that at 8 kms, there is a greater uncertainty from a 1 hr measurement than at 20 mins. Please clarify.

These uncertainties are for the entire dataset. There was a mistake in the uncertainty calculation, due to the various valid ranges troughout the dataset. This is now corrected (Figure 4).

P8L23 – Is Witte et al., still in prep or under review?

Witte et al. is now in review. It is corrected page 7 line 24 and in the references.

P9L9 – Should be McGee, not MacGee

Corrected.

Figure 8/9: There appears to be the largest difference between the lidar and ECC below 8 kms. Is this systematic for all 8 launches? Is this also apparent in the original lidar data?

No, this not systematic for the 8 launches.

Were these sondes launched from Gillot or Maido?

Figure 5 shows comparison between LIO3T and ECC sondes launched from Maïdo, and Figure 6 between LIO3T and ECC sondes launched from Gillot.

It is useful to have a profile of the number of comparisons to make discontinuities apparent.

Right. Figures 5 and 6 now give the profile of the number of comparisons.

If the potentially contaminated (e.g from aerosols) data were removed would the results improve?

We did not make the exercise yet, but the use of the 532nm channel to detect and possibly discard aerosol layers from ozone retrieval is in our future plans.

Eq 6, what is reference for the 200 in the numerator? Is this based on sample size?

The 200 comes from the fact that we use the relative difference between two observations ("r"), using the mean value of these 2 observations to not considere anyone as the reference one. Equation 6 is now made more explicit.

Figure 11: What's driving the difference in FTIR uncertainty from the beginning of the time series to the end? Is this the full uncertainty or partial uncertainty? Bottom panel ylabel can just be D.

The full uncertainty is used here for the FTIR and the lower uncertainty shown in 2013 was a

mistake. It is now corrected.

Further suggestion #1: Instead of the cross histogram in figure 15, show a complete time series of all the data in the archive used to make this plot. Showing the reader the entire data set instead of the histogram will emphasize the observed variability in O3.

This is a good suggestion. However, we chose not to present the LIO3T time serie because it is too sparse for the time being (84 profiles over 1084 days) to make it easily readible.

Further suggestion #2: One very unique piece of information at the lidar site location is the ability to observe this enhanced O3 related to biomass burning. In the section describing the IASA comparisons, it may be helpful to show a world map of one day (or gridded month) where Maido is directly in the center of a CO transport plume, therefore highlighting the location and detection capabilities of the instruments.

The interesting location of the site to observe biomass burning plumes is already documented in numerous previous studies using with ground-based (e.g. FTIR, lidar, ECC) and satellite (e.g. IASI, CALIPSO, MODIS) observations. Consequently, we do not think it is necessary to include such a world map in this paper.