

RESPONSE TO REVIEWER 1

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

The paper describes one of the instruments now making regular measurements of tropospheric ozone at a high-altitude, sub-tropical Southern Hemisphere observatory on Reunion Island in the Southern Indian Ocean. The location of the observatory is in a region of the globe that is under-represented in regular atmospheric observations. The paper is written to demonstrate the quality of the measurements and, as such, their importance in adding to the understanding of global ozone concentrations. The paper provides a chronology of measurements on the island and describes the advantages of the mountain site over the previous sea level site. It is well written and deserving of publication.

Page 2. Several sites are discussed here, Gillot, near the coast, where sondes are launched; the Université de la Reunion, where a lidar was first installed, and the Maïdo site. It would be helpful to have a small Table here with the Lat., Lon., Altitude and distances between the sites. It puts the information in a single location. In the related Figure 1, the color scheme makes some of the print difficult to read – this may be exacerbated in the printing process.

Figure 1 is changed and Table 1 gives the coordinates and altitudes of the measurements sites as well as their distance from the Maïdo Observatory.

Pages 3 and 5. In the discussion of the Raman cell it is not clear if the laser beam is focused into the cell or not. My reading of this (and Figure 5) would lead me to believe that it is not, but this should be stated if it is the case. Also some information as to why such a choice was made. What is the efficiency of the conversion into each of the Stokes lines? D2 pressure in the cell? Here too, a small table with the input and output parameters of the Raman cells for each of the two systems is helpful in understanding any differences noted in the measurements.

The LIO3T and LIO3TUR rely on the same design. The Raman cell is equipped with two silica window lenses that had a focal distance of 75 cm to focus the beam as closely as possible to the center of the cell for optimal stimulated Raman scattering. Details regarding this Raman cell as well as the efficiency of the conversion into each of the Stokes lines are stated in Baray et al. (1999). We do not state this in the article as it is detailed in previous published papers.

Page 4, Line 27: “decrease” should be “decreases”

Done.

Page 5, Line 14: It states that a Hamamatsu 9980-110 PMT is used. I could not find a datasheet for a -110 variant of the R9980. Should this be an R9880-110? The quantum efficiency of the R9980 is quite low below 300 nm, whereas the R9880 is significantly higher. If this is a 9880-110 is it used at the 289 wavelength? This tube is susceptible to signal induced noise in the UV. The R7400 has much better characteristics than the 9880-110 at these wavelengths, but it has less gain.

This is correct: this is a R9880-110 (not a R9980-110) and it is used for the 289nm channel. It is corrected page 6 line 7. R7400 could indeed be used with benefits for the 289nm detection channel, and, following your comments, this is something we plan to do in a near future.

Page 6, Line 26: should this end “with an uncertainty of 5%.”?

Corrected.

Page 7, Line 19: Mount should be Observatory

Corrected.

Page 7, Line 23: Delete “Laser and Raman Cell”, insert “at the transmitted wavelengths,”

Corrected.

Figures 6,7 – Is the fact that there are increasing vertical resolutions as the integration time increases (Figure 6), responsible for the higher uncertainty for the one hour integration, compared with the 20 minute integration?

Uncertainty increases when integration time decreases because of the increasing detection noise (i.e. decreasing signal to noise ratio).

How are the vertical resolutions determined? Is a maximum desired uncertainty used to select the vertical resolution?

Vertical resolution is not selected through a uncertainty threshold, but is calculated as described in Section 2.2.

Figure 8: There is a discontinuity seen at 14 km in both panels. Is this also due to some measurements not reaching beyond this altitude? Was this sonde or lidar related? Figure 9 shows remnants of the same discontinuity.

The “discontinuities” in the mean profiles shown on Figure 8 and 9 are caused by the varying valid ranges in the LIO3T profiles. It is stated page 8 lines 7 and 33. Moreover, Figures 5 and 6 now show the number of LIO3T profiles with respect to the altitude.

Page 8, Lines 24 – 28: Was there a reason for using the non-standard solutions in the sondes at Gillot? If so this should be stated.

The use of a non standard solution was a mistake.

Page 9, Line 5: Insert "The" before "valid range".

Corrected.

Page 9, Line 7: delete "until", insert "near"

Corrected.

Page 9, 14-19. If a Morgane campaign curtain plot of the lidar retrieved aerosol scattering ratio is available, this would be a good place to insert that to go along with the discussion of the volcanic plume. At what altitude were the stratospheric intrusions located. Is this enhanced aerosol visible in the daily ASR plots? This should show up in the figure mentioned here.

Enhanced aerosol loadings (likely coming from the Calbuco eruptions) were observed with the 532nm backscattered signal of the LIO3T (not shown) in these stratospheric air masses entering the troposphere above Reunion Island, which could have disturbed the ozone detection and quantification by the LIO3T, and consequently lower the agreement between LIO3T and ECC soundings during this period. These stratosphere-to-troposphere exchanges involving a volcanic plume above Reunion Island will be the subject of a dedicated study. This is now stated page 8 line 24-28.

Page 10, Line 19: "co-located" should be changed to "compared"

Corrected.

Page 10, Line 23: "set a comparable" should be "set of comparable"

Corrected.

Page 12, Line 9: delete "to a NDACC labellisation" insert "for inclusion within NDACC"

Corrected.