

# ***Interactive comment on “Measurement of limb radiance and Trace Gases in UV over Tropical region by Balloon-Borne Instruments – Flight Validation and Initial Results” by A. G. Sreejith et al.***

**Anonymous Referee #2**

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General comments:

This manuscript presents a newly developed balloon-borne UV spectrometer performing limb-scatter observations with the goal to retrieve (lower) stratospheric ozone concentration profiles. The instrumental setup is briefly described, two flights have been carried out to date, and some first results on the retrieval of O<sub>3</sub> slant column densities are presented. The technical components appear to be relatively inexpensive and off-the-shelf, which makes this instrument attractive for other groups. In principle, I think a manuscript like that is of interest to the scientific community. The present manuscript,

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however, lacks details and in-depth discussions typical of the usual AMT manuscript. The main section of the paper (4.2) covers barely one page, and the main result is an O<sub>3</sub> slant column density profile. I ask the authors to retrieve a vertical density profile from this SCD profile. Otherwise, the reader cannot judge, how realistic the presented O<sub>3</sub> SCD values are. My guess is that they are too low, but I may be wrong. In my opinion the manuscript requires a major revision, before it can become acceptable for publication in AMT.

Specific comments:

Title: "Flight Validation"

I don't fully understand the intended meaning of "flight validation". It suggests that some aspects of the balloon flights (trajectories ?) were validated, which was not the case, as far as I can tell. I suggest removing this from the title.

Page 1, line 7: "It can be used to measure the column densities"

Unclear what column densities – or what species – you refer to here.

Page 1, line 8: "upper atmosphere"

Please be more specific. For some people the upper atmosphere begins at the tropopause, for some at the mesopause.

Page 1, line 17: SOLSE/LORE is not a good example to highlight that spaceborne observations enable measurements over long periods of time, because SOLSE/LORE was shuttle based with a mission duration on the order of a week.

Page 2, line 8: "et al.," -> "et al."

Page 2, line 20: add space before "Right"

Page 3, equation 1: It would be good to list the values of the fit coefficients C\_x

Page 5, line 11: "The relative radiance in these bands is given by"

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I don't understand why equation (2) corresponds to a "relative" radiance.  $I_{\text{band}}$  is simply the mean radiance over the corresponding spectral range. Something is missing here.

Page 5, section 4.1:

The motivation for averaging over these two very wide spectral ranges (280 – 315 nm and 315 – 420nm) remains unclear. Also, I'm not sure what the intended purpose of Figures 6 and 7 is. This should be made clear or the Figures should be removed.

Page 5, line 15: "the dotted lines represent an exponential fit in agreement with results obtained Weidner et al. (2005)"

It's not evident what aspect specifically is in agreement with the results by Weidner et al. The absolute values of the "relative" radiances?

Page 5, line 25: "broadband" -> "broad-band"

Section 4.2 (Trace atmospheric gases)

To me this should be the main section of the paper, demonstrating that this instrument is capable of providing robust observations of vertical ozone profiles. I think this section is far too superficial and lacks important details. Looking at Fig. 9, I would have expected slightly larger O<sub>3</sub> SCDs. SCD values of  $6 \times 10^{+18} / \text{cm}+2$  roughly correspond to 220 DU, which is close to the vertical column for the location of the observations. It's difficult to tell without AMF calculations for the specific wavelength range used here, but I would expect the SCD to be larger than the vertical column density. Whether the retrieved SCD values are realistic can be checked either by retrieving a vertical O<sub>3</sub> density profile or by using a RT-model to simulate the SCD profile for a realistic ozone density profile. In my opinion the first should be done before the paper is acceptable for publication in AMT.

Page 6, line 2: "trace gas strengths". "Strength" is not really a technical term, I think. Please use, e.g. slant column density.

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Page 6, line 22: "Our signal to noise ratio of 2.06"

Was the SNR really that low? Looking at panel a) and b) in Fig. 8 it seems to be much higher – at first glance.

Caption Figure 8: "(clockwise from top)". The Figures are not arranged clockwise.

Figure 9: The abscissa label says "ozone concentration", which is incorrect (ozone slant column density).

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