

# ***Interactive comment on “Compact and Lightweight Mid-IR Laser Spectrometer for Balloon-borne Water Vapor Measurements in the UTLS” by Manuel Graf et al.***

## **Anonymous Referee #2**

Received and published: 30 November 2020

The paper by Graf et al. "Compact and Lightweight Mid-IR Laser Spectrometer for Balloon-borne Water Vapor Measurements in the UTLS" describes the development and deployment of a balloon-borne laser spectrometer for water vapor measurements in the upper troposphere and lower stratosphere. The paper is generally well written. I have a few comments that should be addressed regarding some of the statements in the paper.

### **General comments:**

It should be clearly stated that the development and testing of this sensor is far from complete if the authors claim measurement capability in the lower stratosphere. The

Printer-friendly version

Discussion paper



sensor must undergo much more detailed testing under LS conditions. The large humidity bias shown at below 10..15 ppm is inadequate for measurements in the lower stratosphere. The claim in the title that this sensor is for UTLS measurements is misleading. Many other research groups have spent incredible amounts of effort into sensor development, incl. multi-year inter comparison campaigns at climate chambers (cited in this manuscript).

Specific comments:

Title: I believe that the title (and paper) should not state that the presented instrument is for measurements in the UTLS, but rather for tropospheric soundings. The results presented do not warrant lower-stratospheric measurements.

P1, L9 The sentence "An open path design reduces the risk of contamination, allows fast response..." is contradictory of the results presented. Measurements presented here are indeed "contaminated".

P3, L67 ..the number of molecules within the light path can be..

P3, L73 which values from a spectroscopic database?

P4, L90 The integrated linestrength?

Fig. 2 indicate parameters such as pressure, concentration, altitude

Fig. 4 Explain in the main text what the problem of the fitting procedure was.

P10, L222 Fig. 6(a) should be Fig. 6(c)

P10, L231 the agreement of the slope is fine, but the intercept is really important, too. Especially when the goal of this instrument is to accurately measure extremely low H<sub>2</sub>O. This is probably difficult to transfer from the weak absorption line probed for this test to the strong one due to different baseline shape, which might highlight a weak point of this experiment.

[Printer-friendly version](#)[Discussion paper](#)

Fig. 6 "A precision of 0.11 % at 1Hz is.." 0.11 % of what? Also  $R^2 = 1.018$  should either state the slope or the correlation coefficient I assume.

P13, L278 Figure 8(a) should be Figure 8

P16, L351 No, you were not successful to measure LS water vapor.

---

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-243, 2020.

Printer-friendly version

Discussion paper

