Review of

A Reel-Down Instrument System for Profile Measurements of Water Vapor, Temperature, Clouds and Aerosol Beneath Constant Altitude Scientific Balloons

by Kalnajs et al.

This manuscript presents the successful first deployment of a new, innovative reeling system in combination with proven sensors that measure in situ high-resolution vertical profiles of water vapor, aerosol and cloud particles as well as ambient conditions in the tropical tropopause layer (TTL) from drifting long duration ballons. Some technical difficulties are described in the paper along with solutions to overcome them, so one can expect that this system will provide detailed measurements during the planned campaign, which will provide new insights into the structure of the TTL. Consequently, this paper is within the scope of AMT and I recommend publication.
The paper is well structured and fluently to read, some mostly minor comments are listed in the following.

1) Page 2 and 3, Figure 1: Please give et a better overview of how the entire system is composed, as I must confess that I don't get an idea of it from the current presentation. I recommend to indicate where the different components of the payload are located in more detail in Figure 1 (maybe add a photo ?) and the text (pages 2 and 3): RACHuTS – the primary balloon gondola, the smaller subgondola, profiler with sensors, reel system, upper gondola (the 'Euros'), lower gondola (the 'Zephyr').

2) Page 3, line 70: you might add here a recent study summarizing water vapor and ice cloud measurements from aircraft experiments, including experiments in the TTL:

Krämer, M., Rolf, C., Spelten, N., Afchine, A., Fahey, D., Jensen, E., Khaykin, S., Kuhn, T., Lawson, P., Lykov, A., Pan, L. L., Riese, M., Rollins, A., Stroh, F., Thornberry, T., Wolf, V., Woods, S., Spichtinger, P., Quaas, J., and Sourdeval, O.: A microphysics guide to cirrus – Part 2: Climatologies of clouds and humidity from observations, Atmos. Chem. Phys., 20, 12569–12608, https://doi.org/10.5194/acp-20-12569-2020, 2020.

3) Section 2, Instrument Description: It would be convenient for the reader if the panels and colors of the components shown in Figs. 2 and 3 would be also noted in the text.

4) Section 2.2.3, RACHuTS Optical Particle Counter:

How is the inlet design of the ROPC? The sampling efficiency of particles larger than ~ 3-5 µm is probably biased by the angle of the inlet to the airflow and the velocity differences between in- and outside of the inlet. I recommend to mention these effects.

The low upper size limit of 10 µm in diameter limits the ice cloud detection, as ice clouds often consist of larger ice particles (the total range is ~ 3 – 1000 µm in the TTL). This could be also noticed in the section.

5) Page 9, line 267-68: ‘ RACHuTS was hosted on the ‘TTL3’ configuration of the Zephyr, sharing the gondola with an LPC ...’

I’m a little puzzled about the location and characteristics of the LPC (see also comment 1)) ?
A brief description (on page 5 or in section 2.2.3) would be helpful.

6) Page 10, Figure 5: Labeling of the panels (‘a’ and ‘b’) are missing.

7) Page 12, line 373: Figure 7 could be referenced already here. In the caption Figure 7, I would mention the water vapor contamination from outgassing from the balloon and gondola surfaces at < 67 hPa. Without this explanation the profile looks strange.

8) Page 13, Section 3.4 ROPC Performance: As noted earlier (comment 5), a brief description of the LPC (including sampling characteristics) would be helpful, in particular as it is now used for comparison with the ROPC. Could differing sampling characteristics be responsible for the difference between the instruments (see also comment 4) ? Adding a Figure about the instrument comparison would not unnecessarily lengthen the paper.

9) Figure 8: Labeling of the panels (‘a’ to ‘d’) are missing.