Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2020-423-RC2, 2020

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurement report: Properties of aerosol and gases in the vertical profile during the LAPSE-RATE campaign" *by* David Brus et al.

Anonymous Referee #2

Received and published: 11 August 2020

The manuscript "Measurement Report: Properties of aerosol and gases in the vertical profile during the LAPSE-RATE campaign" by Brus et al. provides a description of UAS platform measurements of particles, trace gases and meteorological parameters in the San Luis Valley of Colorado in July 2018. The measurements were made as part of a multi-institution campaign associated with the ISARRA meeting that was held in Colorado that summer. The authors provide substantial details regarding the instruments, platforms and operation, and as such, the manuscript serves to provide a solid example of the kind of research that can be accomplished, and likely most effectively, using sUAS platforms. The manuscript is well organized and fairly well written, but the readability would benefit from careful copyediting for usage and punctuation. Overall,

Printer-friendly version

Discussion paper

given the focus of the paper on the description of measurements and measurement systems rather than scientific analysis, I would think the manuscript would be a better fit in AMT than ACP.

General comments:

The authors should be consistent with the description of the team (FNMI-KSU) or teams (FNMI and KSU)âĂŤboth are used in the manuscript, e.g. L42 “A flight team”, L44 “by the FMI and KSU teams”

In terms of lower atmosphere/boundary layer studies, height AGL is more relevant or important to know than absolute altitude (MSL). Similarly, for diurnal processes such as boundary layer development, using local time is clearer than UTC, which requires the reader to calculate the local time to interpret the data.

The discussion of the vertical profile observations is mostly descriptive rather than analytical, with the exception of the final paragraph of 3.2.2 (NPF), which would still benefit from substantially stronger arguments to derive the conclusions from the observations.

Figures 4 and 5 are somewhat tangential to the focus of the manuscript. The inclusion of the descent data in Figure 9 clutters the picture when it has been argued in the text that the ascent data are believed to be more reliable. A single panel with both ascent and descent for comparison could be included instead to illustrate the description in the text.

Specific comments:

L14: The opening sentence of the introduction is a bit absolutist. Perhaps “Most air pollution, including both gases and particulates, is released near the surface from various sources.” The specific mention of wet deposition seems out of place since it is discussed nowhere in the manuscriptâĂŤit could be omitted.

L18: The sentence “The atmospheric boundary layer can be investigated. . .” lists many measurement methods and relevant references, but then just stops without any follow-

ing statement about why this list was presented. UAS are merely included as one item instead of the paragraph being used to set up the paper by describing why one might use sUAS instead of, or to complement, other methods.

L46: suggest replacing “leveraging” with “utilizing” or “using”

L72: “employed a parachute system”âĂŤwas the parachute actually used regularly for landing, or was it there in case of emergency (power failure) and not actually needed during the campaign?

L79: If 15.5 kg GTW / 5.5 kg PW would have been too much for operation at the altitude of the SLV, what were the actual KSU Matrice operational weights for LAPSE-RATE?

L85: “These modules were easily detached. . .swapping between sensor modules”âĂŤbut since you were using two aircraft, did you actually swap the payloads? It didn’t seem so from the description of operations.

L90: “The CPCs were calibrated”âĂŤperhaps “were set”, “were adjusted”

L92: The voltage applied to the TEC (or Peltier cooler) sets [or regulates], the temperature difference between the saturation and condensation regions

L94: given the cut-off (50%?) diameters of 7 and 14 nm how did the temperature instability limit the detection of sub-20 nm particlesâĂŤhow much did the cut-points vary? Was this incorporated in uncertainty, or was the delta-T measured and compensated?

L96: “The platform was enclosed on all sides except the bottom with polylactic acid (PLA) foam to shield”; “Bosh” → “Bosch”; “pressure (P), temperature (T) and relative humidity (RH).

L100: “6 ms and $\pm$1 hPa for P, 1 s and $\pm$0.5 °C for T, and 1 s and $\pm$3% for RH.”

L120: “oxygen”? Assumed to be $\sim$20% of P?

L128: suggest stating here that the AQT400 was not useful in the SLV environment.

L146: How long was the horizontal inlet?

L147: What was the nature/purpose of the POPS “custom electronics”?

L149: What is the expected effect of the POPS not being shielded from the sun over the duration of a profile? Did you evaluate the effect by running the instrument on the ground for the same period to see if a measurable effect occurred?

L163: Typically, MSL would be denoted “altitude” and AGL “height”.

L178: “A detailed description of the daily meteorological conditions in the SLV during the LAPSE-RATE campaign”

L181: The data presented in figures 4-7 seem to indicate that the surface measurements were not continuous, but only occurred during portions of each day

L219: “according to the US Environmental Protection Agency”; EPA or USEPA are not needed since there is no further reference in the paper

L230: “based on which the goal”âĂŤperhaps “the goal of which was to reach the highest altitude possible in a very short time.”

L256: From figure 10 it appears that the bias between the two CPCs was fairly systematic, raising a question about either the determination of cut-off diameter or relative sampling efficiency. This potentially affects quantitative analysis of the results, but does not necessarily impact the qualitative conclusions drawn

L273: The discussion of the Flexpart back trajectories and interpretation of the resulting footprint (shown in Figure 11) is rather superficial and speculative

L293: The description of the effect of aircraft motion on the POPS sampling is somewhat vague. How did the motion cause the effect? Was it the same for the horizontal and vertical inlet configurations (L145-147)?

L298: “was 5 cm-3, similarly averaged PM1”âĂŤshould either use a “;” or “, while”

L304: “evaporation”âĂŤ“transpiration” if just from plants or “evapotranspiration” if from the environment (surface + plants)

L310: “from a BME280 sensor that showed a bias of about. . .”

Figure 10: Suggest labeling the panels in order (A, B, C) and change the references in the text to match

---

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-423, 2020.

Printer-friendly version

Discussion paper