

Recommendation: Accept with major revisions

General Comments

This data overview paper outlines and describes the rotary-wing UAS data collected by the University of Nebraska-Lincoln in the 2018 LAPSE-RATE campaign. The writing is clear and concise and the paper is decently well structured. There are a few aspects that I would like to see improved before publication, and I move to accept with major revisions to enhance the details of this paper.

I think that the discussion of the hardware (Section 2), though concise, was well handled and provides a thoughtful overview of the system utilized for data collection. However, more information about the logistics of data collection (Section 3) would be nice.

The biggest complaint that I have with this paper is that it is lacking in context and specifics. This paper feels detached from the special issue's context. It currently does not even reference the campaign's overview article in this special issue or the Bulletin of the American Meteorological Society that would help provide the missing backdrop for this data set. Please make a greater effort to tie in your work to the context of the larger effort.

In general, there are a few stylistic points that could be improved as well. Most figure captions are also lacking in detail that could help to better inform the reader about the purpose of including the figures. This issue should also be addressed in the main text by discussing the figures and their significance more. Moreover, please be sure to follow the ESSD journal conventions for including numbers and units (see here: <https://www.earth-system-science-data.net/submission.html#math>). Please see the points below for more specific instances of these recommendations.

Major Comments

- Section 1, Introduction: in general, this paper is missing the context of being part of the larger LAPSE-RATE campaign, which should be improved by including references and discussion for at least the following:
 - de Boer et al. (2020a): <https://doi.org/10.1175/BAMS-D-19-0050.1>
 - de Boer et al. (2020b): <https://doi.org/10.5194/essd-12-3357-2020>
- Sections 1 and 2.3: while the authors do a good job of discussing their sensor housing setup, it is also important to include references to other studies that have performed similar work to provide context to someone trying to use this data that

may or may not be familiar with UAS sensor housing and limitations. I would therefore like to see the following:

- Provide more discussion/details here from the the Islam et al. (2019) paper to better contextualize this specific aircraft.
- Depending on the specific details you include from the Islam et al. (2019) study, it would also be beneficial to elaborate more on the Villa et al. (2016), and Prudden et al. (2016) studies.
- More context could be added by including and possibly briefly discussing the Greene et al. (2019) study (<https://doi.org/10.3390/s19061470>), which is effectively a continuation of their 2018 study you already cited and is more closely related to the applications of the sUAS discussed in this ESSD paper.
- Section 3.1 (L 107): The reader has no context for what these sites are without the introduction of the LAPSE-RATE campaign as a whole, which is currently missing from Section 1. Please provide proper context (and citations) to how these sites fit with the larger campaign as well as some details about them.
- Section 3.2: I think this section would benefit from further organization, more specifically by splitting each day into subsections and provide more details per day (please look at the other accepted/published papers in this ESSD special edition).
- L 142: You mention using a “zero-order-hold-method” here as your main data processing method. Please elaborate what this method is and how you applied it here in constructing your data files.
- Section 3: In Line 124, you mention you could not go to altitudes above 120 m because the NOTAM was not active. This sentence is a bit misleading because there is no mention of how else you accessed the airspace and generally the NOTAM is just the proof the request was filed properly. This section would benefit from what permissions you relied on (COA or 107 exemption) and what your maximum allowed altitude was. With more people getting into sUAS work, it's important for people within our community to be transparent about how to legally do this work.
- Section 5 Special topics of interest (L 152): I very much enjoy the presentation of how this data set can be used to examine broader questions of platform and sensor performance. However there is little to no context as to why these topics are important for people outside our community who might be interested in using this as sounding data. I suggest you provide few sentences of background as to why each of these are important before saying which flights may be utilized to examine this phenomena. For example, what are some of the challenges

associated with not optimizing ascent/descent speeds? Wind direction versus sampling?

- Figures 4 and 5: I'm not sure I understand the utility of presenting the data in this manner. Especially in the humidity sensors you seem to be having a fair bit of hysteresis. Please provide discussion as to whether this is an accurate depiction of the environmental variability or if it more closely linked to sensor hysteresis.

Minor Comments

- L 8: replace “temperature/humidity sensors” with “temperature and humidity sensors”
- L 8: I believe there is a subject/verb disagreement in “...attempt to separate them...”
- L 14-15: more references providing examples of how multirotor UASs are gaining popularity would be useful
- L 16-16: What are some examples of applications that would benefit from sounding data with increased spatiotemporal resolution? Additional references and specifics here would be nice.
- L 20: please define the acronym “CLOUD-MAP”
- L 25: what do you mean by “validity of the measurement”? Please elaborate.
- L 39: to conclude the introduction, please include a general outline for how the rest of the paper is organized.
- L 44: there should be a space between the number and units; “mm” should not be italicized
- L 47: change instances of “m/s” to use a “-1” exponent instead
- L 50, Section 2.2 header: remove the colon at the end
- L 54: remove the comma after “GPS” at the start of the line
- L 55: insert a space between “1 Hz”
- L 56: please define the acronym “DAQ” as this is the first instance of use
- L 61: insert “the” so it reads: “In the data files, the first two sensors...”
- L 70: unit conventions on 5m/s
- L 79: ‘Fail’ should be ‘failure’.
- L 81: insert a comma to read as: “...DAQ, debugging, and periodic...”
- L 84: ‘Interface’ should be ‘interfaces’.
- L 90: please connect these sensor descriptions back to the diagram of the UAS in Figure 1 for reference.
- Section 2.5 in general: please make the boldface headers into subsections. For example, L 91 should change to: “2.5.1 UAS platform M600P1”, etc.
- L 100: add an “s” onto the end of “sensor” to read as: “It also allows comparison of the sensors mounted on...”

- L 101: Add a comma after “when the primary sensors fail,”
- L 101: Remove the comma in the date at the end of the line to read as “17 July 2018”.
- L 103: fix the unit conventions for “grams”
- L 105, Section 3 header: remove the comma after “locations”
- L107: add an “and” and “the” to read as: “...Leach, India, and Charlie in the LAPSE-RATE flight campaign”.
- L 113-114: “ascended to the height of the MURC tower.” How tall is that?
- L 113-114: fix the unit conventions for m, m/s, and seconds.
- L 119: fix the unit conventions for m and m/s
- L 119: change “in Golf and Gamma location” to “at the Golf and Gamma locations”
- L 120-121: Please split up the weather descriptions here and for the other days into multiple complete sentences.
- L 124: fix unit conventions for m and m/s
- L 127: add an “s” at the end of “condition”
- L 141: add “the” in front of “UAS flight controller”
- L 143: “1 second” should be “1 s” to be consistent with unit conventions
- L 150: please describe the file conventions in detail here even though it is also included in the README file to be consistent with the other published/accepted papers in this ESSD special issue.
- Section 5 in general: please specify subsections for the bold headings and remove the colons after the headings. For example, L 154 should read as: “5.1: Calibration”.
- L 160: date format earlier in the paper was DD month YYYY; please change to be consistent here
- L 161: add a local conversion to MDT from UTC
- L 161-162: unit conventions for m and m/s
- L 165: unit conventions for m/s
- L 171-173: this information more appropriately belongs in the caption for Figure 3
- L 174: change wording at the beginning to be: “Figures 4 and 5 show primary sensor...”
- L 195, References section: please alphabetize your references
- Table 3: No. of Flight should be plural
- Table 3: Please make more noticeable if multiple aircraft are at the same location for a day (e.g., add an “&” in between them)
- Figure 1: additional close-up photos of the shields and under-body should be included to give the reader a better spatial understanding of the UAS sensor payload

- Figures 3-5: It would be helpful to label your panels A, B, C, D, etc. and then further describe the nuances in the captions.