

## ***Interactive comment on “Remote sensing and radiosonde datasets collected in the San Luis Valley during the LAPSE-RATE campaign” by Tyler M. Bell et al.***

### **Anonymous Referee #2**

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This manuscript details a set of ground-based and in situ measurements use to quantify the atmospheric state of the San Luis Valley, Colorado, in July 2018. The described measurements correspond with a series flights of remotely piloted aircraft systems (RPAS) that were conducted as part of the LAPSE-RATE campaign. The goal is for this data record, which is based in traditional sampling techniques, to provide a point of validation for the measurements made from newer RPAS platforms. The scope and relevance of the data set are in line with the goals of ESSD. The description of the instrument operations is sufficient, and the data record is properly documented. I suggest several comments and edits of the of the manuscript be considered before publication.

Specific comments: (1) Improving the level and specificity of the writing will allow the manuscript to more efficiently convey the information being discussed by the authors.

A few examples of writing quality issues are listed below (and more are mentioned in the minor comment portion of this review):

P1 L15 What are examples of traditional meteorological techniques used to sample/profile the ABL?

P2 L34-36 “While the primary focus of the LAPSE-RATE field campaign was showcasing the benefit that RPAS observations can have on filling the data gap, these observations must be collected alongside existing and commonly used instruments in order to demonstrate any advanced quality of RPAS observations.” There are many sentences written in an indirect manner which make, in my view, it difficult to understand this paper. As an example, the quoted sentence could be rewritten as: Observations made from RPAS need to be validated against accepted standards to be scientifically useful.

P2 L30-31 “This paper focuses on data collected by these remote sensors and radiosondes, since they all collect vertical profiles of the atmosphere. ” This sentence seems unnecessary and all that needs to be said is: “The paper is structured as follows...” and then go into the list of sections the reader will encounter while reading.

Nowhere in the text are the collection dates of data given. The reader must look at the figures to infer this information (7/15-7/20?).

(2) The introduction does a good job of describing current limitations of remote sensing techniques and why these result in gaps in various data records. However, the introduction would be more compelling if it did a better job addressing how RPAS are currently, or in the future might be, used to fill in the data gaps left by various remote sensors.

For example, the authors state that remote sensing observations have drawbacks including “limited range and operating conditions restrictions” but never suggest or dis-

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cuss a practical approach to how RPAS might actually help to mitigate these problems. It seems that many of the conditions that restrict use of remote sensors, like rain, would also impact RPAS operation. That is, if RPASs are being advertised for their ability to gather data when traditional remote sensors cannot, a discussion (or an example) of the feasibility of RPAS to address these gaps in the data record is warranted.

(3) Including a concise overview of all of the data products provided is highly recommended. This could be in the form of a table or figure. For example, in Section 4.2 the authors described products that can be derived from the CU DL measurements, but it is not clear if they actually provide these higher-level products in the uploaded files.

(3) I am not sure what utility Figures 1-3 & 5 add to the manuscript. This document is fairly long and so removing these figures and their descriptions could be a way to make it shorter. If you do leave Figure 1 in the paper, it might be best to add annotations specifying the instruments that are referenced in the text of the manuscript.

(4) Is a description of the calibration procedures of the CLAMPS sensors and the CU DLs relevant? Lidar systems are not my expertise, so I am not sure of norms, but typically documenting/noting calibration procedures is useful when detailing remote sensing data.

(5) It might be best to move Figure 4, the map with instrument locations, to the start of Section 2. It is here when a knowledge of the geographic locations of the instruments become relevant to understanding what is going on with the study setup.

Minor comments: P1 L3 & P2 L26 Is LASP-RATE the official name of this project? Perhaps reconsider the use of the word “dubbed” which implies the name is informal.

P1 L20-22 Can you be more specific about what kind/type of measurements are impacted by rain when making this comment. A reference here would strengthen the argument.

P2 L34-36 This sentence reads awkwardly.

P3 L62-63 “However, the wind measurements from this campaign should be used carefully as the trailer was not optimally sited for environmental wind speed and direction measurements due to the close proximity to the Moffat School (see Fig. 1).” Figure 1 does not show the Moffat School, so it is unclear what the reader is supposed to see in this figure in the context of this comment.

P4 L69 What was the motivation for co-locating the two CU DLs at the airport?

P4 L71 Specify the lidar system you are describing when opening a paragraph.

P4 L71 Is it line-of-sight wind velocity?

P4 L72 “...a temporal resolution of about 1 Hz along...” Is the sampling rate of the lidar system documented or have a standard?

P4 L73-75 This sentence might read more clearly if the term “DBS” is introduced at the start of this paragraph. It appears to be the topic at hand.

P5 L87-92 Why not just put this paragraph, which is only describing information relevant to radiosondes, into Section 2.4?

P5 L95 What are the “other shortcomings” of radiosondes? Can a reference be provided that details these limitations?

P6 L127 “...more significant influence on the air temperature as the sensor is heated ...” If the distinction between true and measure air temperature is made in line, this comment would be easier to parse when reading for the first time.

P9 L167 Maybe list here what variables are retrieved?

P10 L169 A more detail description of the retrieval would be good so the reader understands why the iterative approach is necessary.

P10 L176 What’s an approximate lower bound for the resolution for the AERI data for the maximum heights at which RPAS fly?

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P10 L189 DBS was already defined in Section 2.2. Perhaps the Lundquist et al., 2015 reference should be included in the earlier section when DBS first comes up.

P10 L195-197 What specific variables are included by the authors in the data files? A summary of the LASP-RATE campaign, including sampling statistics for all of the instruments, and derived quantities provided, would go a long way to making this manuscript more useable.

P11 L221-223 More detail is needed about the point-to-point GPS location method used for measuring wind speed. Is the acceleration of the balloon considered? Or is it assumed that the balloon accelerates instantaneously to the speed of any air that it is in? The details of this method are not described but they need to be.

P12 L228-229 I do not see the colored lines representing temperature measured by the radiosondes in Figure 6a.

P12 L237 Over what period of time did the radiosonde launches take place?

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