Title: Observations of the thermodynamic and kinematic state of the atmospheric boundary layer over the San Luis Valley, CO using remotely piloted aircraft systems during the LAPSE-RATE field campaign

Summary: The manuscript describes sampling strategies and data collection using remotely piloted aircraft (RPA). Additionally, there are sections on platform inter-comparability, data quality, and processing. Lastly, techniques are described to evaluate the thermodynamic and kinematic state of the atmospheric boundary layer (ABL) over complex terrain with focus on applications for convective initiation, drainage flows, and ABL transitions.

Recommendation: The authors present the results from an interesting and unique field campaign. I recommend publication with minor revisions.

Key points:

I suggest reorganizing the manuscript a bit for clarity. Section 4 "Data Processing", comes at the end of the paper but it would strengthen the conclusions in Section 3 "Examples of Flight Data" if Section 4 was moved earlier into Section 2.1 "Description of the CopterSonde". Along this line of thinking I suggest moving Table 4 out of the summary section and showing it earlier in the paper. In the summary it is suggested to include larger implications to the data collection and analysis such as if the datasets collected throughout the six days led to improved forecasts for the San Luis Valley or did the campaign provide an avenue for increased use of RPAs in WMO, NOAA, or NCAR field campaigns? Line 19 of the introduction mentions, "unique opportunity to undertake an intensive comparison of the sensing capabilities of the aerial systems being utilized as a part of the campaign." But the summary does not reiterate the reason this opportunity was unique or its lasting implications.

It is nice to see the larger detail in figures 3 and 4 but it would help the reader in the discussion of comparisons if the figures were side by side or closer together.

Section 3.2 would be strengthened with more discussion on accuracy and precision of the dataset rather than just listing references so moving Section 4 earlier can address this. Additionally, adding in comparison data on figures from the radiosonde flights, CLAMPS AERI and Doppler LIDAR observations would be beneficial.

The following suggested changes are to help with clarity;

Line 35-36: Type of sensors (WMO approved)? Moving table 4 up would be helpful here.

Line 44-45: "Section 6 will provide concluding remarks about the dataset as well as future outlooks regarding the future applications of the dataset." The summary section does not seem to currently include "outlooks regarding the future applications of the dataset."

Figure 1 and Line 56: An immediate question for the reader is how the props influence the atmospheric sensors when viewing figure 1 then on line 56 it is mentioned the props were changed. Including a sentence or two on how prop wash has been considered would be helpful to the reader.

Line 64-69: Resolution of sensor measurements differ among variables. Moving lines 186 – 190 here would be helpful to the reader.

Line 123 – 124: Why different ascent and decent rates? Are rates optimized for sensor accuracy accounting for airflow? Was 10s loiter data kept? Did you use separate surface platform measurements to combine the last 10m of descent? Moving lines 199 – 208 here would be helpful.

Figure 3: The significant digits on the temperature contours seem to imply a measurement precision that is contradicted in table 4.

Line 136 – 137: It is mentioned that flight frequency changed between 15min and 30min for MOFF site but figures 3 and 4 both show changing flight frequency depending on time of day. It would be helpful to describe why flight frequency changed at particular times. For example, there is an hour between flights on figure 3 (1500 – 1600) and there is an increase in flight frequency on figure 4 from 1830 – 1944.

Line 141: "Figure 3 also shows the post convection cool down around 1800 UTC." This cool down is difficult to discern in the figure given the changing temperature contour separations and not knowing measurement precision (unless table 4 is moved earlier). It could help the reader to give actual temperature values or ranges to strengthen this observation.

Line 154 – 155: "While a small bias between the two aircraft exists in temperature . . ." At the surface and at 600m this looks to be almost 2 degrees which may not be small given the claim of a post convection cool down in figure 3. For all the graphs, does showing error bars make the graphs too difficult to read? Having the error bars could support the claim that the biases are small and winds show reasonable agreement.

Line 157: While it is helpful to have references on the accuracy and precision of the dataset, it is recommended the authors address this issue in at least a paragraph to support the claims of the inter-comparison flights similar to the explanations given in section 4 Data Processing.

Line 165: Please give the time for local sunrise.

Line 230: "intercompariblity" is misspelled. Intercomparability