



Comment on **essd-2020-392**

Anonymous Referee #1

Referee comment on "The Large-eddy Observatory - Voitsumra Experiment 2019 (LOVE19) with high-resolution, spatially-distributed observations of air temperature, wind speed, and wind direction from fiber-optic distributed sensing, towers, and ground-based remote sensing" by Karl Lapo et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2020-392-RC1>, 2021

General Comments

This is a very interesting manuscript and presents an instrumentation array capable of resolving very fine spatially distributed scales of turbulent motion that I think will be of great interest to the community. There is no doubt to me about the quality of work behind the manuscript and its importance.

The data is made available at the given repository and is well-organized.

The balance of the manuscript is generally good in terms of the attention paid to each section, though I would like to see the two example cases (second especially) fleshed out somewhat as the data presented is very interesting but difficult to follow.

Specific Comments

Line 5 (style): per SI standard you should leave a space between units. E.g. '1350 m' instead of 1350m. This is applied inconsistently throughout the paper.

25: Please clarify the statement that "[Taylor's Hyp. is] necessary to invoke when observing atmospheric turbulence". This is too reductive and it should be specified in which contexts this assumption is actually necessary.

33: Consider here as well Mahrt (2008) Mesoscale wind direction shifts in the stable boundary-layer. Tellus 60A, 700-705

42 (typographic): two sets of only closing apostrophes are used as opposed to an opening and a closing.

46: the name of the experiment here is spelled differently than in the abstract.

49: "... has been shown to be accurately resolve air temperature" <-- grammar error

75: 'demonstrates the unique observations from the [...] tethered balloon'. Please qualify this statement as this is not the first time that balloon-tethered DTS has been deployed, see Keller et al. (2011) in *Atm. Meas. Techn.* doi:10.5194/amt-4-143-2011

Fig. 1: this is quite minor but the labels d) and e) should be switched for readability as one follows a-c clockwise as opposed to row/column

As a general question relating to the temporal resolution: how were times synced and did the Ultima sample precisely at 1s? We found in field deployment that the actual temporal resolution was < 1 Hz though the data provided in the repository are only provided as seconds since x.

127 (typographic): the s in Campbell Scientific should be capitalized

137: the soil measurements are never returned to. Are this mentioned simply for completeness?

148: Silixa is located in Elstree

163: Could you provide an extra sentence or two on your reference baths: To which temperature was the cold-bath cooled? What was the step-regime for the warm bath? Was it warmed and then cooled continuously through some range? Which range? Etc.

167/492: Your Hausner reference seems to be missing two authors: Selker and Tyler. Is the calibration process accounting for internal instrument temp?

179: Are you able to provide a quantitative estimate re: the accuracy of the alignment process and subsequently an induced error/confidence in the wind speed/dir measurements from the FODS array? This is quite important.

182: δ LAF is written with/without a space between delta and LAF and with/without italicized LAF. Please be consistent.

192: '1.3m height agl': height is tautological here.

198, 200, etc.: units are arbitrarily italicized or not throughout the manuscript, within the same sentence, etc.

203: the difference referred to here is due to the splice? The LAF? Cable-specific properties?

207: The abstract notes 1350 m of FODS measurements though there the cable length of 2.8 km is given. Perhaps you can clarify the lengths in a table or separate sentence(s) as the current reading is confusing.

210: "kilfometer".

Figure 4: Some additional context to these biases might be helpful. What are we to interpret from a slight over/under-estimation? Does this affect the wind measurements or only the temperature? Can you speak to the (presumably) diurnal cycle? Perhaps I've misunderstood something but how is a separate bias for the inner vs. Outer rectangle calculated if they're spliced to the same cable? Or does 'each cable' in line 214 mean 'each subdivision'? Please clarify.

247: no need to re-define agl

248: stable boundary layer is uncapitalized here but capitalized elsewhere.

252: length of reference sections?

306: "The vertical orientation..." <- I'm confused by this sentence. Is angle of attack not considered because $w \sim 0$ near the surface or because of the vertical orientation of the cable? The sentence implies both.

Figure 5 caption: "following van Ramshorts et al. van Ramshorts et al. (2020)"

355: I don't know what Fig. 1c is meant to illustrate to me in the context of this sentence

382: Labels should be Fig. 7a,b,c,f?

386: Can you elaborate a bit on how you've determined the structure extent? Just by eye or some analytic approach?

388: "at any given point the submeso-scale structure was present for approximately 2 minutes" how are you determining this? The structure bounds here are both the cold and warm section?

Figure 7:

- > the colour maps are applicable to the entire plot?
- > what are the limits of the wind dir plot? It's difficult to tell from this what the wind direction / direction of travel of the structure is
- > a vertical wind speed from the sonics is missing: does it remain ~ 0 ? How accurate is the $w \sim 0$ assumption employed by the FODS wind direction in this circumstance? What is estimated error associated?
- > what is the cause of the vertical banding in e)?
- > are these plotted with interpolation=none? I was unable to find the script used to create these.
- > There are 3 different date formats within this one plot