The manuscript describes a micrometeorological dataset consisting of observations from both traditional instrumentation and distributed fiber optic measurements of air temperature and wind speed. The authors describe the motivation behind the measurements, details on the instrumentation used, and present two examples of submeso-scale structures observed during the experiment.

The measurements are unique in the scales (hundreds of meters) and resolution (sub-meter) they cover, and will be very useful for micrometeorological research into the weak wind stable boundary layer.

While there are detailed explanations for most of the setup, some gaps are still present, mostly related to the DTS setup and calibration of the DTS data. Thus, I suggest that the authors consider the following comments and improve the manuscript.

General comments

It was a shame to see that the FODS wind direction data is not presented in this manuscript, even though this is in its title. I would like to ask the authors to add some data on this, if this is possible, even if it is just a comparison with the traditional sensors.

The calibration of the distributed temperature sensing data is glossed over quite quickly, with information on the setup missing, e.g., the temperatures and homogeneity of the reference sections, the length of fiber in the reference sections, which specific sections were used for calibration and which ones were used for validation.

In what kind of environment were the DTS machines located (temperature controlled or not?), and did their internal temperature show strong diurnal variations? I think that extra information on the setup could aid the reader with interpreting the results. A complete detailed analysis of the DTS calibration might take up too much space in this manuscript, and it possibly does not strongly affect the results of the wind speed measurements or submeso motion analysis. In that case I would like to advice the authors to skip figure 4 and just mention the mean biases in the text.

Lastly, how much uncertainty was introduced by the single-measurement calibration? If no time integration of calibration variables was done, the short (1s) integration time can make the temperature of the reference sections quite uncertain unless there is a long length of fiber in each reference section.

Specific comments

Line 47 'inelastic' does not add much information here, and might just confuse the reader.

Line 117/118 The use of spaces '1min' vs. '30 min' is inconsistent. Following the SI rule to add a space between the numerical value and unit symbol could make the text more clear (here and elsewhere).

Line 134 A verb is missing from "Air temperature and humidity"? E.g. 'were measured'

Line 156 If it is solid state it is not a 'bath'. Change this to e.g. 'solid state reference section'?

Line 168 Why did you not choose to employ a double-ended setup? Could you say more about the expected errors or uncertainty?

Line 171 ΔLAF has not been explained previously

Line 187 How were the heated and unheated cables attached to the tower, and at what distance from the tower itself? Could you elaborate on this here or in section 5.1

Line 189 Perhaps changing '50um' to the used fiber type (e.g. OM3) is more clear. The diameter of the internal waveguide does not help the reader much. (same for Line 200)

Line 200 What does SBJ stand for?

Line 216 What was the maximum range of the Ultima-DTS used? This was not specified earlier.

Line 218 I do not agree with this conclusion based on the currently presented information. Too many other variables changed to make an assertion on the specific cause of the change in bias. At a minimum a more in-depth analysis of the calibration would be required to support this statement.

Line 226 The optical fiber was loosely buffered.

Line 228 Did the four optical cores differ so significantly in LAF that this was required? How much did they differ in length?

Line 230 You state they were calibrated 'as' a single length of fiber. Was it one continuous fiber without any spices? This is not fully clear from the text.

If there were splices, calibrate over the splices?

Figure 4 It is not clear to me which device was used where and when, or where along the fiber these validation sections were.

Line 251 Could you specify 'OM3' (or OM4) instead of '50um'?

Line 251 How were the water baths kept at a temperature, and how were they mixed?

Line 256 It seems that the cable was spliced somewhere? This is not mentioned. Please add this and mention the issues of having a splice within a section of optical fiber.

Line 280 Why would you not provide an already calculated wind speed for users of the data set to compare their calculations to? This would allow them to at least check if they made no large mistakes.

Line 300 How did you treat the data in the case of the observed heated fiber temperature being lower than the non-heated fiber temperature? Due to, e.g., uncertainty in the DTS measurements.

Line 303 Could you elaborate on the setup of the wind speed measurement along the tower? How were the cables attached, kept stable, etc.

Line 309 How was the heating rate varied? Manually? Based on what information?

Line 309 What does it mean to "optimize wind speed"?

Line 310 What do you mean by "DTS bin"?

Line 313 I am quite puzzled by this result; why would a lower heating rate lead to a bias? I would think that, in the case of perfect observations of fiber temperature, the bias would be very low at low heating rates and increase as the heating rate increases (due to generation of free convection).

Is this a result of uncertainty in the temperature observations? What are other possible sources of the observed biases? Please elaborate.

Line 317 Why are the biases compared to the heating rate, instead of the temperature difference? The temperature differences for each heating rate would vary according to the wind speed. Are the temperature differences not a cause of bias, as opposed to the heating rate.

Line 324 Would these high temperature differences (up to 31 K!) lead to free convection? Did you check your data to see how dominant forced convection was, using e.g., the Archimedes number.

Line 328 What was the orientation of the tower? Judging from the photograph it looks like the cables are located approximately on the north-east side of the tower. I would assume that if one would take care during deployment, the shortwave radiative shadow errors can be largely eliminated.

Line 335 I am a bit disappointed to not see any results of wind direction presented here even if it was a simple comparison with the CSAT. Could you add such a short example here?

Line 338 I assume you mean "…as FODS wind speed."?

Line 356 The (lack of) wave-like patterns in the first ten minutes is not too clear to me from looking at the FODS wind speed in the figure (I would say that the waves start at the same time in both fig. 6e and 6g). It is quite difficult to see this in a 2D color plot. Were the wave-like patterns visible in the CSAT data or not?

Line 362 Do you mean tower observations of wind speed? I do not see FODS wind direction presented here.

Line 378 Is a video of this event available somewhere, e.g., as a supplement? That could make the motion of the event much more clear to the readers.

Line 405 The 'upward-directed sensible heat fluxes' are not clear to me from the figure. Are negative sensible heat fluxes upward? I would expect the opposite, and I do not see the sign defined elsewhere

Line 420 As you mention the response time here; do you have an estimate of response time for the different cables used? This would be very useful information for users analyzing the data.

Line 424 If the fiber of the reference sections is spliced to the measure fiber this can degrade the calibration accuracy. Please mention this drawback.

Would it not be possible to separate the metal tube from the optical fibers by breaking only the tube through, e.g., metal fatigue? This could provide electrical insulation without damaging or severing the optical fiber.

Line 426 Was there a significant current flow through the wet grass, or were the power failures mainly the (essential!) safety features of the heat pulse system. Would low voltage heat controllers be a solution to this? Lower voltages (<50 V) would be much safer to handle and would have a much reduced current flow through the PE coating.

Line 436 What would be the reason for saving the raw data separately in a single-ended fashion? What information is lost if you do not do this.

Technical corrections

Line 39 Parentheses around Sun et al.

Line 42 Here (eg. around 'DarkMix', and 'dark side') and elsewhere: the quotation marks only have the right hand version. ' ' vs. ' '

Line 144 Missing capitalization of Stokes and anti-Stokes

Line 152 I think you meant to use 'i.e.' instead of 'e.g.'

Line 154 Comma after 'coiled'.

Line 158 Correct to 'thermoelectrically'

Line 182 deltaLAF is in italic instead of regular font

Line 198 "W m^{-1}" is in italic instead of regular font

Line 210 Typo in 'kilometer'

Line 211 'inner and outer rectangle' instead of 'inner- and outer rectangle'.

Line 245 "FLYFOX" capitalization is not consistent with "FlyFOX" elsewhere.

Line 291 "W m^{-1}" is in italic instead of regular font

Line 331 "ms^{-1}" is in italic instead of regular font

Line 354 The time format in the text is inconsistent with the figures, could you homogenize this?

Line 392 "…between 0311Z and 0322Z,"

Line 397 Extra "change"? Sentence is not fully clear.

Figure 7 The label *k)* is not visible behind the legend.

There is very little space between figure *k* and *m*, making the x-axis labels slightly unclear

Line 569 Remove “chap.” from citation. Add a page number or remove “p.”