

## ***Interactive comment on “Suitability of fiber-optic distributed temperature sensing to reveal mixing processes and higher-order moments at the forest-air interface” by Olli Peltola et al.***

### **Anonymous Referee #3**

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Review of Suitability of fiber-optic distributed temperature sensing to reveal mixing processes and higher-order moments at the forest-air interface by Peltola et al.

#### General Comments

Overall, the manuscript presents the usefulness of a new and increasingly important tool with respect to spatial measurements of turbulence and atmosphere-ecosphere interactions. The manuscript is generally well put together but are a few places where some clarification is needed (see minor/technical comments below) to improve the message being presented. It is an interesting concept that adds to the toolbox of measurement techniques beyond the traditional flux tower setup to investigate the un-

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derlying turbulence that drives scalar fluxes in different landscapes and glad to see if developed further.

Across the manuscript, the spatial extent/direction of the measurement needs to be clear. My only broader comment is in relation to the connection between the flow and temperature variability; the connection between these two values needs to be better supported; there are places where it appears the two variables are used interchangeably and it can lead to a little confusion for the reader (Sections 3.4). This is primarily an organizational issue, not a science issue.

#### Minor/Technical Comments

Pg2ln6: “practical point-of-view” meaning a sufficient amount of spatially distributed tower measurements?

Pg2ln6: “Hence...” Not sure how many spatial stats are being derived directly from time series observations at a single point; this needs to be clarified; its point is a little convoluted. I will agree that eddy structure, particularly in the vertical, is assumed from time series using Taylor’s hypothesis but I don’t necessarily agree that spatial statistics are being derived through Taylor’s hypothesis.

Pg2ln8: “Another motivation...” feels tacked on; could be better framed to fit within the overall context of the need for more spatially explicit measurements.

Pg3Ln23: “Furthermore, we evaluate...” remove “also” from this sentence.

Pg3Ln25: “Deviations from Gaussian distribution are...”; assuming distribution of temperature? Clarify.

Pg5Ln19-23: “When comparing the results...” Not sure these two sentences are needed; there isn’t that strong of a comparison back to the Thomas et al., 2012 paper within the manuscript. Though this work is based off the Thomas et al., work, unless a direct comparison within this paper is going to be made, the differences in the instrument variant is does not need to be explicitly stated.

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Pg6Ln16-19: "After determining the differential attenuation..." I suggest splitting this into two sentences at the semicolon instead of keeping it as one longer, complex sentence since it is detailing two distinct processing steps.

Pg6Ln23: "After quality filtering..." Out of how many potential 30-minute periods, either as a percent or total measurement periods?

Figure 3: Put the height of the sonic anemometer within the figure caption; easy to miss being the title of the graph.

Pg12Ln16: "The temperature variance was dominated..." This feels out of place; there isn't any direct support for this comment near this sentence and think it should be later in the paragraph/section after the discussion of Figure 5/Table 2 or in the previous section with the discussion of the power spectra comparisons. Also strikes me as being a statement that applies to above the canopy and not as much within the canopy due to the general size of eddies closer to the ground and surrounded by obstacles (trees).

Pg14Ln5: "size eddies dominating..." should be "size of eddies dominating..."

Pg15Ln7: Remove the "but" from "The mean potential temperature gradients from DTS bug exhibited..."

Pg16Ln4: "For comparison, the unbiased median temperature gradients...", Gradient between which heights; across canopy?

Pg16Ln15: Remove "already" in "hence a smaller..." sentence.

Pg16Ln33: The word "almost" is misspelled.

Pg17Ln6-8: "The measured skewness profiles..." There is little to no context for this sentence as it requires the reader to look up these papers or be very familiar with them to understand the similarities in the skewness profiles. Clarify or add context to the sentence or remove.

Pg18Ln8-9: It might be better to mention of the caveat using Taylor's frozen turbulence

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hypothesis on this analysis at the beginning of the section instead of in the middle of the paragraph, or break the paragraph in half to be clear which pieces of the analyses are relying on Taylor's hypothesis.

Pg18Ln32: "Flow patterns..." This sentence is not saying anything new that the next sentence is not already saying and is not a very useful sentence. Maybe combine the two.

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