Respond to reviewer #3:

The authors present a very challenging approach to measure wind and sensible heat flux with fiber optic distributed temperature sensing. Unfortunately, the results of the study are not so promising as it appeared that the shroud did not work well to measure vertical wind speed. I appreciate the authors braveness to submit (partly) failed experiments. Also failed experiments can help the community to learn. Having said this, I think the current manuscript needs major revisions as it seems more a good draft then a full paper (yet). Problem statement and method section miss essential information and certain choices are not well explained. Additionally, I think that also many of the figures can be improved with less abbreviations and make them more self-explanatory (e.g., by giving the figure titles as 'setup 1, setup 2'. this would also reduce the caption lenght). In the attached pdf I commented in detail. Here I only indicate my main comments.

We appreciate your time and effort in reading through the manuscript. We found your comments very helpful and will revise our manuscript in response. Here in the open discussion period, we respond to your general questions and main comments. We will address all remaining detailed comments during the subsequent revisions. Based on your comments, we will add more details to the problem statement and the method section and revise the figures to make them clearer and more readable.

1- The outline of the study is that the authors first investigate several shroud configurations on a grass field (EBG). The 'best' shroud is then later used in a follow-up experiment in a forest. However, in the method section there is barely any information on the different setups and why shroud color, mesh size, rigidity or shape would affect the measurements. What were the design criteria. This part should be extended and improved.

   We will update the details of the shroud design and criteria in the manuscript. About the shroud design, we iterated multiple should configurations in different diameters (1 and 0.6 m), gray and white colors, small and large pore size should, and a shroud with and without supporting metal mesh underneath the shroud. The reasoning line for each selection is:

   I. Diameter: The task was to design a shroud to eliminate the horizontal flow while keeping the vertical flow perturbation intact. We thought increasing the shroud diameter could increase the horizontal flow disturbances inside the shroud since it offers a larger pathway for airflow. On the other hand, decreasing the shroud diameter and placing it close to the sonic anemometer could cause systematic turbulence created with the shroud itself.

II. Length: We determined the length of the shroud over the grass to be long enough to accommodate the typical length scales of the vertical turbulent flow, keep the sensors away from shroud structure-induced flow disturbances, and be feasible to install, given the available hardware and facilities.

III. Color: We used the gray shroud first. Initial results showed substantial heating of the shroud material during daytime conditions inducing strong upward directed (free-) convective heat transfer and thus distorting flow statistics inside the shroud. In response, we changed the shroud's color to white to avoid possible errors, together with increasing the pore size of the shroud,

IV. Mesh size: The initial mesh size was selected based on the previous experiments in the group and then improved based on the initial results.

V. Rigidity: The very first setup of the shroud was designed without supporting mesh and was just a tensioned shroud with two rings at the top and bottom. We observed that the shroud gets very unstable during wind gusts and induces uninvited turbulence. We decided to make the shroud rigid enough to avoid this problem.

2- Why are not all the shroud experiments (EBG) compared to the sonic (thus also setup 1 and 2)? Now the benchmark is the 'unshrouded' FODS measurements, which is also an experimental method. I would benchmarkt the shrouds to the sonic as this is likely closer to the truth.

We could not understand this comment completely. All the conducted statistics in the EBG experiment and the forest are benchmarked to the sonic observations. If the question means bringing FODS in the x-axis in figures 7 and 8, we will swap the axis to plot the FODS against sonic. Otherwise, we would appreciate it if you clarify the comment.

3- Base the first test, the authors pick 'the best shroud' setup to apply it in a forest. Only surprising change, is that 'suddenly' the shroud lenght is increased. While from study 1 the authors could have learnd that dimensions matter for the wind direction. This is in my view a major shortcoming of this paper.

This question was also raised by reviewer #2. We provide the same answer here as well.

We increased the length of the shroud from 1.5 m at EBG (Part 1) to 3 m for the forest environment (Part 2) because the minimum resolvable scale with fiber-optic cable and DTS device used in this experiment is 30 s (Freundorfer et al. 2021). In the preparatory phase of the experiment, our analyses yielded a mean magnitude of the vertical wind speed perturbations of 0.1 ms^{-1} for the Waldstein subcanopy site; hence a shroud length of at least 30 s * 0.1 ms^{-1}= 3 m seemed optimal to sample the passing eddies by FODS. The turbulence spectrum in rough forest canopies is dominated by organized turbulent motions resulting in more low-frequency turbulence compared to short-vegetated grasslands; hence the integral length scale is larger. This adjustment seemed necessary to capture to main energy-containing eddies.

4- Despite the admitted 'failure' of the forest experiments, the authors still show the initial plan to calculate the sensible heat flux. But what is the value of this, once the wind speed measurements are not correct?
We believe there is a misunderstanding. We computed the distributed sensible heat flux using FODS for all heights (0 to 30 m agl), but chose to report the sensible heat flux for the unshrouded part (12 to 17 m agl) to compare against the eddy-covariance estimates because the vertical wind component at this height range shows the most promising signal to noise ratios. In other words, we compute the sensible heat flux based on the successful part of the FODS section. Our experimental design did not yield meaningful results for the shroud heights ranging from 2.5 to 5.5 m agl (see Fig. 2).

5- The reference list contains 34 references, from which 16 are from the own research group. This is almost 50%! I highly recommend to put the study into a more broad context. Many other groups also worked in this study field, including groups that also work with FODS
Thank you for bringing this issue to our attention. We will revise the references to make them less group-centric, particularly for the general forest turbulence sections. However, the FODS community is still small, and most researchers are interrelated and learned the FODS technique from our work group. Many author names you suggested are coauthors of our group members in the cited literature. We look forward to more researchers discovering and applying the utility of FODS techniques in the future.

In the attachment, I added some suggestions.

We will address all of your detailed comments for the revised version. Thank you again for your helpful comments and recommendation.