

Dear Reviewer,

Thank you for reviewing the manuscript. Your comments were very helpful and improved the quality of the manuscript. The responses can be found below each reviewer comment.

RC 1. The experimental set-up needs to be defined better: what height agl is the lidar, does the beam point up or down? The lidar must be equidistant from the masts surely, but doesn't seem to be on fig 2 – pins in wrong locations? Where exactly is the beam waist position relative to the sonic?

Response: The manuscript already mentions the height above ground level for the lidar system on p.5 l.25. An updated Google Earth screenshot has been replaced for the left panel in fig. 2, where the positions of the sonics are more clearly visible. The following information has been added to the description of the experimental setup section:

1. The horizontal alignment of the lidar system
2. The focus position lies slightly above the sonic anemometers

RC 2. There's an assumption that lidar volume always > sonic volume, but this would reverse at short range. The sonic transducer distance is 0.175m, but with a CW lidar focused at a few m, the probe length is shorter than this.

Response: It is true that the lidar's probe volume reduces as the focus distance is reduced and it could potentially be smaller than the transducer length of the sonic anemometer. However, here the focus distance of the lidar system is fixed and the probe volume is much larger than the sonic's transducer length.

RC 3. On p8, the misalignment ambiguity is not, as suggested, related to homodyne lidar operation. It's just a consequence of the complete absence of any info on the components perpendicular to the beam. L/R ambiguity is discussed, but what about up/down?

Response: This is correct. The sentence has been revised and split into two indicating ambiguity in direction and misalignment, respectively.

RC 4. It would be interesting if the authors had looked at whether the 3 methods are sensitive to CNR – I would expect that to be the case. Maybe for another paper? This would help to inform decisions on optimum laser O/P for future systems.

Response: Yes this is an interesting aspect. The numerical simulations do not contain any noise and thus represent the ideal case where $\text{CNR} \rightarrow \infty$. The experimental data could be grouped into different CNR classes, but that would require large additions to the paper, which we think would make a major delay in the publication. We will consider it for another publication.

RC 5. A few minor typos require correction here and there

Response: We have revised the manuscript and corrected the typos. The changes are indicated in a mark-up pdf file called 'amt-2018-229-RC1+2 - Markup.pdf' and the final version can be found in the pdf file 'amt-2018-229-manuscript-version2.pdf'.