Author Comments:

We would like to thank the referees for their valuable feedback, which has enhanced the clarity of this manuscript. We have carefully considered each comment and revised the manuscript accordingly. Our point-by-point responses are provided below.

RC1: https://doi.org/10.5194/wes-2025-165-RC1, 03 Oct 2025

The manuscript is well-written and presents the information in a clear and straightforward manner. I am concerned, though, that the new method for filtering DBS scans presented here is behind the state-of-the-art. For instance, Steinheuer 2022 (see below) introduces a method to filter DBS and VAD scans and adaptively reject low-quality measurements. An added benefit is that they use radial wind speed only, avoiding issues associated with fixing an SNR cut-off (which should vary with lidar settings). I would like to see more thought given to other methods such as the one they propose, or direct comparisons against results employing other methods. Or, if other methods are inappropriate for use on the lidar hardware itself given hardware limitations, that could be noted as well. That is, the proposed method might be preferred for running onboard the lidar given its simplicity. In any case, additional justification is needed for the current method compared to other methods.

J. Steinheuer, C. Detring, F. Beyrich, U. Löhnert, P. Friederichs, and S. Fiedler, "A new scanning scheme and flexible retrieval for mean winds and gusts from Doppler lidar measurements," Atmospheric Measurement Techniques, vol. 15, no. 10, pp. 3243–3260, May 2022, doi: 10.5194/amt-15-3243-2022.

Answer:

Thank you for sharing this article; it is indeed relevant in the context of data availability. However, performing a comparison with all the methods proposed in that paper is not feasible, as they used scanning lidars, which can measure many radial velocities on the cone base, as well as changing elevation and azimuth angles. In the BEAM 6x lidar, there are six different beams with fixed, preset elevation and azimuth angles, and the instrument does not provide any mechanical rotation or optical scanning of the beam direction.

To address the referee's comments, we have added a citation to the paper, as well as an explanation of the hardware limitation for comparing the adaptive method with other methods mentioned in that article.

"Despite the variety of scanning patterns and suggested elevation and azimuth angles for wind lidars (Steinheuer et al., 2022), this study focuses on a fixed beam geometry due to the hardware limitation. Nevertheless, a similar algorithm could be applied to instruments operating on the same principle."

Based on a simple comparison, we find that the adaptive method outperforms any fixed configuration (e.g., 6 or 3 beams, mentioned in Steinheuer et al., 2022) in terms of availability, because a fixed configuration represents only a subset of the possible combinations in the adaptive approach. This result is illustrated in Figure 6, which compares a fixed configuration of five beams (referred to as the standard method) with the adaptive method. Similar results and conclusions are expected in comparison with other fixed configurations. To address the referees' comment about comparison, the following sentence has been added to the manuscript:

"A comparison with fixed configurations will logically show that wind speed availability will always be equal to or higher for the adaptive method, as a fixed configuration is merely a subset when the SNR constraint is satisfied."

The study presented here has several aspects that reveal interesting insights and different points of view compared to Steinheuer et al. Below, we outline the main differences and provide corresponding details in the manuscript (written in double quotation marks below).

- **Validation at higher altitudes:**

  "The work presented here offers several aspects compared to previous studies that reveal interesting insights and diverse perspectives. One aspect is that the validation of measurements is performed at higher altitudes, up to 244 m, where reduced availability makes accuracy assessment more demanding compared to lower altitudes (e.g., 90 m), where availability is nearly complete and accuracy is generally assured. Extending this validation to even higher altitudes would be especially valuable, as the differences between the accuracy of DBS methods are expected to become more pronounced as variations in availability are more significant."
- **Challenges with Doppler fit residuals:**

  Although a fixed SNR threshold may not be ideal in all situations, it offers a simple and practical approach compared to more complex methods that require tuning multiple parameters. For example, in Steinheuer et al., one parameter depends on the residuals of the Doppler velocity fit, which can be challenging to interpret and tune, as it is difficult to distinguish between poor fits and turbulent flow.

  "Another criterion that can be discussed is the residuals of the fit to Doppler velocities (Steinheuer et al., 2022), which can be calculated after performing DBS. We do not recommend relying on this metric, as high turbulence can also result in a high residual, making it difficult to differentiate between a poor fit and turbulent flow."
- **Velocity retrieval despite partial beam blockage:**

  "The adaptive method provides an additional advantage in terms of the beam blockage issue. If one beam is blocked by a solid object or otherwise compromised, velocities can still be

retrieved using a combination of the remaining beams. This addresses a common issue faced by clients, who sometimes must return complete datasets to lidar manufacturers for post-processing of the Doppler measurements when a single inclined beam is blocked or otherwise compromised, as no velocity reconstruction is possible in the current setup under these conditions. Using the adaptive algorithm, this problem is avoided, allowing the retrieval of velocity without the manufacturer's intervention, and also saving significant time and effort."

All in all, we believe that the findings of this study are of interest to the wind lidar community and to wind farm developers, offering practical insights for measurement strategies and data processing.