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Interactive
comment

Interactive comment on "Wind Field Reconstruction from Nacelle-Mounted Lidars Short Range Measurements" *by* Antoine Borraccino et al.

Antoine Borraccino et al.

borr@dtu.dk

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Dear Dr. Di Domenico,

Thank you for your time and comments on our article. We appreciate the positive feedback.

Your minor remark on the details of the minimisation problem and optimisation algorithm is helpful. The points you raised had been considered during the development of our Wind Field Reconstruction methods. Here are our comments:

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1) on the problem convexity

The convexity of the "cost function" of the minimisation problem would ensure the uniqueness of the optimal solution, i.e. the found local minimum is also a global minimum.

To test the convexity of a multi-dimensional function, one would formally need to derive or numerically approximate the Hessian matrix of the cost function and determine whether it is (semi)-definite positive. We chose a more basic approach where we tested the variability of the fitted WFC vector solution with a number of different initial values (thus allowing to start the optimisation from a farther point in the multi-dimensional space). Even with rather silly initial values (e.g. speed of -300m/s, yaw misalignment of 180deg, negative induction factor, etc), the results were found to be identical.

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2) on the algorithm tuning parameters

We used the default damping parameter of the MatLab-integrated Levenberg-Marquardt algorithm. Changing the damping parameter value would mainly result in a change of convergence speed, zhich has never been a problem in this study.

The tolerance values – both on the V_los residual vector and on the change in WFC vector over the last optimisation iteration – were tested. The fitted WFC values proved to be negligibly sensitive to the tolerance values, for all values smaller than the default ones. Therefore the default values were selected for the results presented in the paper.

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In the submitted version of the article, we chose to avoid such highly technical details in order to focus on the most central parts of the model-fitting WFR. However, it appears valuable to mention those points. We will most probably add a couple paragraphs in Section 2.2 ("Formulation and solving of the minimisation problem"), based on this interactive discussion.

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