

Review of *R1: Effect of different source terms in atmospheric boundary modelling over the complex terrain site of Perdigao* by K. Venkatraman et al.

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I would like to thanks the authors for their answers and corrections. I have a number of remaining comments that are not properly addressed. My main concern is related to the grid refinement study, which shows that the applied grid is not sufficient. Therefore, the conclusions of the article do no hold and I cannot recommend the article to be accepted in the present form. The grid refinement study itself is neither sufficient, as described below.

Main comments

1. P 1.1: There are still undefined parameters in the article: for example what is the value of G ?
2. P 1.5: It is great that you have added a grid refinement study. What is the reason that you have not changed the number of cells in the vertical direction? It seems that you have only looked at the influence of the horizontal grid refinement. A proper grid refinement study needs to include all three directions. In addition, the grid refinement study shows some worrying results of the wind speed profiles because the results are not converging with grid refinement (the difference between medium and fine is larger than the difference between coarse and medium. This indicates that you need a finer grid or there is something wrong with the numerical setup. Furthermore, the grid refinement study indicates that your current chosen grid size (the coarsest grid in the grid refinement study) is not sufficient. This is major problem in the article because all the conclusions are based on the results of the coarsest grid.
3. P1.6: Great that you have added results for the inflow profiles. It seems that the ABL setup (with Coriolis and ABL height) under predicts the TKE (or TI) by quite a margin, which makes a comparison/validation with measurements challenging. You could actually find a set of G and $\ell_{\max}$ that gives you a matching TI at a reference height (as long as the TI value exist for a given z_0 and G). See for example the Appendix of a recent work of my own [1]. If you cannot get a matching TI, then you could choose to change the roughness height for the ABL inflow.
4. P1.7: You mention that you focus on the influence of the source terms; however, you do validate and evaluate the performance of each the model with the measurements throughout the article and in the conclusion. Hence, I think it makes sense to perform a range of wind wind directions and apply a Gaussian filter as post processing step, especially if the wind direction standard deviation is as large as 7° . You could at least perform two additional wind directions representing the standard deviation ($231 \pm 7^\circ$) and look at the difference between the three wind directions.

References

- [1] van der Laan, M. P., Kelly, M., and Baungaard, M. A pressure-driven atmospheric boundary layer model satisfying rossby and reynolds number similarity. *Wind Energy Science*, 6(3):777–790, 2021.