WIND ENERGY SCIENCE DISCUSSIONS

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Interactive comment on "The impact of a forest parametrization on coupled WRF-CFD simulations during the passage of a cold front over the WINSENT test-site" *by* Daniel Leukauf et al.

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General Comments

The paper describes a case study of a front passage as it is downscaled from WRF into a microscale OpenFOAM simulation using forest parameterizations in both models. The simulations are compared with a met mast and UAS flights. I'm afraid the paper is not rigorous enough at describing the model-chain with sufficient detail to judge the quality of the coupling between mesoscale and microscale modeling, which is the most relevant feature of the modeling methodology. Other than providing the referenced papers, there is little justification about the models and parameters being used, missing

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Discussion paper

important descriptions about the equations, boundary conditions, etc. The validation is mostly qualitative making it difficult to understand the value added by the different features in the model chain. In my opinion, such complex coupling should be first tested in flat terrain (without and with forest) to make sure the codes are consistent with each other before attempting a complex site such as this one.

Specific Comments

93 - Please specify which k-eps model is being used and how is it parameterized to solve ABL flows. For instance, there is no mentioning of the Coriolis force or ABL relationships for the k-eps constants that are typically used in atmospheric flows.

95 - WRF forest parameterization does not include turbulence source terms like in the OpenFOAM model?

100 - The selection of constants in the forest model are taken from the literature but it is not justified how those constants an LAI profile are suitable for the type of forest on the test site

103 - discretion > discretized

115 - Please provide more information about the vertical structure of the microscale grid and the time step used in the URANS simulations. How many points within the 20-m forest height?

111 - Please specify which boundary conditions and how the mesoscale data is introduced. Are there humidity or energy equations in the OpenFOAM simulation?

129 - Specify the simulation period

134 - Why is the UAS "well suited for wind energy research"? How long does it take to fly each leg (6 times)?

235 - It is difficult to judge the differences between UAV and WRF in this figure? Why not using profiles along a few heights where we can see the two datasets in top of each

other?

312 - Please avoid using vague statements like "at least to some degree" if you can quantify how much UAS and model compare to each other

Figures- Quantification of model error is not provided to understand the value added by the microscale simulation. Time series or profile plots are visualizations, not a measure of performance

336- "the present work shows that the combination of WRF and an OpenFOAM based CFD model is able to simulate the wind condition at the WINSENT test-site accurately" I think that there is no evidence in the paper of the model-chain providing accurate results, at least for wind energy standards

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