Geoscientific
Model Development
Discussions

Interactive comment on "The Explicit Wake Parametrisation V1.0: a wind farm parametrisation in the mesoscale model WRF" *by* P. J. H. Volker et al.

Anonymous Referee #3

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General Comments:

The authors present a new parameterization of wind farms for mesoscale models, in particular for WRF. The explicit model is well described in the formulation as far as I understand, although I admit I haven't reproduced the equations myself. There is however little justification as to how the freestream is selected or the individual source terms of the turbines aggregated to the grid-cell values. Adopting a common cell velocity U0 and adding individual thrust forces together to form the grid-cell overall thrust is an ad hoc solution that seems appropriate as first approximation. Then sigma_0 is used to calibrate the wake model to the Horns Rev results. The doubt resides on whether this calibration holds for completely different layouts. For example, a layout occupying the

same space that Horns Rev and with the same type and number of turbines but very different distribution would produce the same wind farm wake following this methodology. I agree with the authors that further research would try to account for the specific layout of the wind farm to generate grid-cell values without calibration. There is very little research so far on mesoscale-simulated wakes so I think that the paper is worth for publishing and I look forward to further efforts with this model in the future. The following remarks shall be considered to provide further justification to the evaluation methodology of the paper.

Specific Comments:

Page.3482 Line.23: I would remove "in Northern Europe and China" to make the statement general to coastal areas P3491, L.7: It is not so clear why the cell-velocity is representative of a common upstream velocity for the whole wind farm. P.3491, L.13: add Section number. P.3493, L.21: Can you provide a reference for the roughness length or justify why the value of 2e-4 m has been adopted? P.3494, L.4: Why slightly-stable atmosphere when the validation data is considered neutral? P.3494, L.7: What is the lapse rate of the inversion layer? Probably not a big influence on the results but should be documented since it is an input in the idealized simulations. P.3494, L.16: Was the averaging of the 9 wind direction runs done using a uniform directional distribution or considering the weighted-average following the actual distribution observed in the 30deg sector width? The result can be quite different depending on the averaging procedure P.3494, L.24: It is not clear how the length scale is determined based on the wind speed. Can you clarify this point? Maybe it is just enough to say that the initial length scale should be in first approximation equal to the rotor area. Then you introduce the idea of using the scaling factor to calibrate the model results to the observational data. Figure 9: It would be useful to show the undisturbed upstream velocity profile from both the WRF-WF and EWP models to show that they are actually the same or very similar.