Wind Energ. Sci. Discuss., referee comment RC2
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Review of wes-2020-130

Fabien Margairaz (Referee)

Referee comment on "A pressure-driven atmospheric boundary layer model satisfying Rossby and Reynolds number similarity" by Maarten Paul van der Laan et al., Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2020-130-RC2, 2021

In this work, the authors present a new 1D model for ABL without wind veer (to be used as inflow condition for RANS). The proposed model demonstrates to satisfy Rossby and Reynolds numbers through a few 'numerical proofs'. Finally, the authors demonstrate the use of their model in a series of 1D RANS simulations aimed at wind turbine modeling. The authors also show how the model parameters can be adapted to reproduce the desired profiles.

My main comment is: I would recommend adding extra explanations at the beginning of section 2, to clarify for the reader under which atmospheric stability the model is applicable and how atmospheric stability is introduced (especially given that not potential temperature equation are considered). Otherwise, section 2 read as if the model is only valid under neutral stability and the reader might be confused to see that in section 7 stable condition is considered.

Overall, the paper is well written and only minor revisions are needed. I recommend this manuscript for publication in WES.

 # related to my main comment:

P3L30 - stability is never mentioned before, make this paragraph confusing for the reader. It your model only valid for neutral stability?

P9L23 - "fixed atmospheric stability" How? Maybe I am missing, I am not sure I understand the link with atmospheric stability here.

 # minor comments:

P1L2-4 - "We propose a pressure-driven ... effects of wind veer and ABL depth." Please reformulate this sentence. Maybe expand on 'for isolating the effect of wind veer and ABL depth', as it does not illustrate the goal well.

P1L12 - Please add some references to LES and RANS.

P1L12 - "Lower fidelity models"? never mentioned again, no example or reference.

P1L17-19 - Please add some references for: "In addition, RANS can simulate ... and wake superposition."

P1L22 - Please add some references for RANS model with some added or removed "components of ABL physics".

P2L23 - I would not use the word 'obviously' here.

P2L25 - Please correct: "In the this article,"

P2L31 - ASL not defined (P2L4)

P4L26 - remove 'here', as it makes this more readable

P5L1 - comma misplaced.

P5Eq.7 - missing punctuation at the end of the equation.

P5L15 - "... \hat S = -(S-G). Thus, we ..."

P6L15 - after Eq. (12), use either "with ... as ..., ... as ..." OR "where ... is ..., ... is ..."

P7L13 - 'textbook' - maybe consider referencing Eq. (5).

P8Fig2 - the overlap of the symbols makes the figure hard to read. In addition, some of the quantity plotted are not explicitly presented (I?). I suggest adding some information in the caption of the figure.

P8L3 - "Here, we ..."

P9L9 - this does not read well, what 'it' refer to? Please rewrite.

P9L12 - "... as long as ..."

P9L22 - "... as an inflow model for ..."

P11Fig4 (and Fig5) - the choice of colors for is unfortunate for the no veer ones, especially the light green, which is hard too read both on screen and printed. I suggest changing.