

The study aims to support understanding the validity and variability of industrial wake model output for wind farm planning and power generation estimations running the models for a whole year (selected to be most representative). It consists of two parts, part one which presents the generation of WRF simulations later used as references, and part two applying different industrial models. In both parts it is tried to best separate internal and external wake losses, as well as investigating deviations and their causes, e.g. stability, homogeneity, temporal evolution.

Please have in mind that some of my comments might not be valid as answers can be found within the text - in such cases please consider stating things more clearly to increase accessibility for the readers.

The study is generally well written, but nevertheless needs some work to be optimally supporting the community with the findings. Colours need to be adjusted for accessibility.

E.g. I strongly suggest that all co-authors proofread the next revision to ensure the referees do not have to deal with spelling or phrase doublings.

At some point I struggled with understanding whether the active or passive form of writing has been chosen, or if it differs from chapter to chapter.

General/Throughout:

Choose colors accessible for many more people (including their limited printers)

Subfigure identifier better outside the figure upper left

Unit notation in brackets or standard parentheses (SI)?

Region II uppercase/lowercase?

no WF and other identifiers for the simulations italic without space for better readability?

Correct spelling/case for e.g. TurbOPark and other models? Check throughout!

Passive/active speech? Switches a lot - consider to be consistent.

Br. or Am. spelling?

where possible in the figures, use identical limits

PART I

Abstract:

I miss a phrase about present coupling or non-coupling with the sea surface (SWAN/WAM/..) - at least a hint why it is omitted if so.

Region II is mentioned: throughout the paper "Region II" uppercase/lowercase?

Line 18: external wake (energy?) losses - with or without "energy"?

Introduction and ff:

Line 25: consider replacing "clean energy" with "renewable energy production" or a similar term to potentially avoid discussions about circular economy (resin/fiber recycling)

L80: 1990-2020: Are there projections about future "common" wind climate - e.g. for 2030 or 2050?

L111: Does the selection of 2016 rely only on wind? What about stability, wave climate, water temperature etc? Some reasoning about how representative 2016 really is (respecting relevant parameters used in the study) in terms of the conducted analysis would be helpful.

L123: introduce "recovery rate"

T1: the table would benefit from some formatting

T3: Introduce abbreviations (VU/NN/VS) here?

Around Eq 1-6, add AEP and AEP changes / loss to be able to follow the text.

The expressions "with PE", "without PE" and "no WF" are hard to catch within the fluid text if not enclosed by using e.g. italic font or other marks.

L204: spelling

L228: Phrase a bit unclear

L230: why mentioning "relatively small"? Is there a reference value?

L242: downwind? what do you mean here?

T4/T5: I struggle with wind direction comparisons, as the direction is not well defined in low wind conditions - so errors/differences are better presented in north-vector and east-vector differences (with speed and direction deviation to be calculated easily).

Here, the used values such as R^2 /RMSE in Part II could help understanding the effects / comparison much better and potentially build some trust.

T5: the wind speed bias looks quite systematic. is this a boundary layer effect to be looked at more deeply in your model setup/comparison?

L272: "does not include zero" is ok to understand after reading the whole paper, but consider to clarify this here.

276: phrase?

F3: are you consistent with the definition of deviation/losses/differences? Actual-reference = difference?

288: "not proportional" - consider omitting "strictly"

T6: Sort table? Add direction from/to PE?

301: Phrase sounds strange, interpunctuation?

309: ".. overlap zero loss"?

One could reconsider the naming of the cases (no WF, with PE, ..) and "external" and "internal" losses.

Also recap "internal" and "external" losses around here?

Fig4: Is it worth mentioning or thinking about inversion presence and height?

L347: decreasing? better generally decreasing (as it is not really consistent)?

L350: Phrase beginning here (including ref to Rosencrans 2024) seems very artificial and unnecessary here.

L353: SST/Air Temperature: Also in spring?

L359: Consider weakening the statement to ".. , potentially leading to longer .."

L361: "generating significant thrust" - reconsider wording?

L367: Here you mention "global blockage" - better give a definition / reference

L371: is "recently" correct here (references from 2015)?

L385: spelling

Around L385: Phrase doubling (likely from the writing process)

F11: right ticks

L409: is there a clear research question why you seek to understand this? What is the expectation?

F12: these figures are rather complex. some more guiding in the caption might help. Are the results significant? Error Bar?

F13: UTC/Local Time? Consider averaging for every hour and every month (additional bars between 2d-field and axes), identifier hardly visible

L443: "representative year" - still not completely convinced.

L448: Sentence "The internal.." not clear

L458: Connect phrases?

L465: spelling

L456-end: consider streamlining the text / whole conclusion.

Table A1: consider adding WF density (What is a common measure? Summed-RotorArea/WF-area?)

B1: Mention the idea/parameters of Perkins Skill Score? Future Climate projections?

Part II

Abstract:

The strong statement in the beginning should be relativated as e.g. "Wind energy is regarded essential for ...". After the first phrase, there is a hard break into the next phrase incorporating models. This should be refined. Consider also to say something about external/internal wakes. Line 6, even NWP's can be based on different assumptions - please reconsider the phrases.

Introduction and ff:

Same phrase in the beginning as in the abstract - please vary a bit (and preferably include "regarded")

L48: spelling

L48: between 1 km and 3 km to improve reading?

L60ff: consider introducing model names here

L65ff: is there a reason for the fast recovery?

L69: it's Emeis - please also correct in the bibliography

L76-77: a reference to justify this statement?

L79: name the new developments

L98: Part I without hyphen

L105: rather "adapted" than "extrapolated"?

L112: consider naming the reason for this limitation

L119: For readers not knowing FLORIS, better introduce it as a framework (?) for engineering wake modeling.

L154: Explain what you mean with "hyperparameter" here, or is it clear to the community?

Page6 general: Maybe figures how the different models are built / "act" might help?

L175: spelling?

L205: consider to elaborate why you do not expect long range effects

L222: "In WRF, .." -> rather "we defined the internal wake in WRF simulations as.."?

L245-260: Hard to read and likely not necessary as such? Basically a table expressed in words.

T2: "each metric" -> Colour coding over all setups or granular? Colorbar is important to get color order!

L288: Envelope? Do you mean Min/Max?

L294: replace "calibrated" with "adjusted" or "tuned"?

F2: Mention date selection for further analyses?

F3: Colours not friendly.

L377: Reflection to wind farm density?

L378: between -> between which ones? Or do you mean something like "within"?

F4: Here you begin to use "percentage points" - is there a reason for this?

L393: Restructure phrase?

L395: "relatively larger"?

F5: consider similar scale as Fig4?

F7: I'd prefer to see identical scales for (a) & (b) as well as for (c) and (d). Colours not very reader-friendly.

L466: do you mean "temporal evolution" or "wake dynamics"?

F8: Arrows are wind vectors? Length identically scaled?

F9: Targeted period poorly visible

L493 Phrase "In particular .." sounds strange to me.

L509: "relatively larger"?

L518: spelling

Table B1: color bar

Appendix: Include/explain Appendices some more

L577: check reference