

Review Comment

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Title: Underestimation of strong wind speeds offshore in ERA5: evidence, discussion, and correction

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MS type: Research article

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General comment

This manuscript is discussed about the reason of underestimation for strong wind speed of ERA 5 and proposed its correction method. The reason of underestimation is clearly identified by comparison with other reanalysis data and some modeling parameter. Also, the efficiency of correction method is validated with trustable in situ measurement data. Although there is lack of discussion, the method is clearly mentioned and methodology is useful.

In conclusion, this manuscript has some scientific interest and is important for the industry, a reviewer would like to accept with following some revisions.

Specific comment

Clause/ Subclause	Line number	Comments
1.	24-29	The authors need to explain more detail about each paper referred here. Also, there is no explanation about correction in (DHI, 2023) refence web page.
	34	“the methods published so far only partially address the bias” The authors need to add reference(s) mentioned here.
1.1	55, eq.(1)	(Peña et. al, 2008) and many other papers define eq.(1) as “ $-\psi_m(z/L)$ ”. Although it depends on how the authors define “ $\psi_m(z/L)$ ”, it is suggested to use “ $-\psi_m(z/L)$ ”, as long as the authors refer (Peña et. al, 2008) without special note.
	65	Numerical value for α_M is not appeared in this paper. These parameters are important to calculate z_0 .
	67	Correct “(GSF)” to (GFS).
	73	“ τ is the wind stress (u_*^2)”

		τ is not equal to u^*o^2 but equal to $\rho_a u^*o^2$.
	74	“Drag neutral coefficient” is may not commonly used (sounds like drag is 0). It is recommended to correct the word to “neutral drag coefficient” or “drag coefficient under neutral condition”.
	75	Is “ C_d^2 ” in Eq.(4) typo of $C_{d,n}^2$?
	76	It is recommended to explain that U_n is wind speed for neutral condition.
1.2	78	“wind energy measurement datasets” sounds like energy(power) related measurement data. It is recommended to change it to “wind measurement datasets (created/used by wind energy industry, or add specific project name(s), reference(s) etc.)”.
	Table 1	It is recommended to add measurement height used in this study in this table, at least.
	Figure 2	Geographical location of left bottom box in the figure is difficult to understand. The authors need to Add explanation such as location name or highlight box etc. in the map.
1.3	127	“the range of air-sea temperature difference to $\Delta\theta = T_{4m} - SST < [-2; 0.5] \text{ }^\circ\text{C}$ (North Sea) and $\Delta\theta = T_{4m} - SST < 0.5^\circ\text{C}$ (Atlantic Bight)” It is hard to understand the reason that stability criteria in North sea and in Atlantic Bight are different. Although this part is less important for this paper, the authors need to briefly explain or show references. Also, “ $< [-2; 0.5] \text{ }^\circ\text{C}$ ” might be “ $\in [-2; 0.5[\text{ }^\circ\text{C}$ ” (inconsistency with figure 3 etc.).
	Figure 3	Is “ $[-2;0.5[$ ” semi-open or typo of “ $[-2;0.5]$ ”? There are many abbreviations (e.g. WS100, WD, PL, LL). in the figure. The authors need to explain in figure title or main body.
1.4	141, Title	“1.3 Model data” Duplicated sub clause number
	142-145	Model data is grided, so these are not located on exact position(longitude-latitude) of in-situ measurement. The authors should explain how these differences were

		handled. (e.g. interpolated, used nearest grid etc.)
2.1	155	<p>“the ERA5 model results show larger differences for short fetches”</p> <p>This expression is not good because CFSv2 is not true value. What we can recognize here is just relative relation between ERA5 and CFSv2 depends on fetches. I suggest to modify this to similar expression used for title of figure 5, line 166.</p>
	Figure 4	Explain the meaning and values of the colors using color bar etc. Also, it is needed that the explanation of the white circle plots.
	161-163, title of figure 4	CFSR data is not shown in this figure. It is recommended to remove explanation regarding CFSR data due to avoid confusion.
3	Title	.(dot) in the end of clause title is not needed.
3.1	Figure 7	I recognized $WS_{10m,CDS}$ and $WS_{10m,MOST}$ are essentially derived from the same numerical model, both based on ERA5. However, the scatter between those data seems almost the same level of scatter as, for example, top-right of figure 6. The authors have to explain the possible reasons.
	Figure 10	Wind speed/direction is not uniform in area displayed in figure. Explain the reference coordinate.
3.3	234	There is no detail expression that why the authors chose the value of $\alpha_{ch} = 0.018$. The authors have to explain the reason.
	243-234	<p>“ERA5 with $\max(\alpha_{ch}) = 0.018$ (bottom-left)”</p> <p>Cap method or reduced drag coefficient (z_0 as well) for strong wind is commonly used for ocean surface layer modeling. The authors should show reference(s) caused to get this idea, if there is.</p>
	Fig.11	Quantitative evaluation is not done in this paper. The authors need to show general statistics such as bias, slope, correlation coefficient etc., at least in this figure (recommended to add for other figures).
4		The authors need to discuss about generality, limitation, applicability etc. of proposed methodology. For example,

		<p>$\alpha_{ch} = 0.018$ or this method is ERA5 specific? Applicable for extreme wind speed (validated wind speed is up to 25m/s, validated against 1-hour average wind speed but 10-min average is needed for extreme wind)? etc.</p> <p>Also, $\alpha_{ch} = 0.018$ is originally used in non-coupled ECMWF IFS, so people may think that it better to use non-coupled IFS model directly. Showing separate validation results for long and short fetch may be good to explain the advantage of present method.</p>
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