

Wind Energ. Sci. Discuss., referee comment RC1
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Comment on wes-2021-72

Anonymous Referee #1

Referee comment on "Local-thermal-gradient and large-scale-circulation impacts on turbine-height wind speed forecasting over the Columbia River Basin" by Ye Liu et al., Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2021-72-RC1>, 2021

General comment:

Liu et al. have addressed the challenge of weather forecast uncertainties in wind power. The paper with the title "Local thermal gradient and large-scale circulation impacts on turbine-height wind speed forecasting over the Colombian Basin" look into the sensitivity of wind speed forecast to changes in initial conditions related to two weather events: local thermal gradient and the passage of a large-scale cold front. Their work is well written, their work brings attention to the role of initial conditions in the overall wind forecast uncertainty. Although their study area is limited and the result are site-specific they show the importance of considering initial condition (IC) uncertainties in the wind speed forecast for wind power. Their usage of the method self organizing map (SOM) technique clearly illustrates the advantage of this method in terms of clustering and projecting the result onto dominant nodes influencing the forecast uncertainty. I would suggest publication in Wind Energy Science after minor revisions.

Specific comments:

RC1) Have the results from the WRF-ARW model run been validated prior to this analysis?

RC2) In the introduction, line 80, the authors write "The WFIP2-optimized NWP model is used in this study.". The authors do not explain this model in any way. Instead, in section 2.2 the authors state that they use the WRF-ARW for the initial condition perturbation. I found this a bit confusing. Please clarify.

RC3) Line 46-54: The authors write about ensemble sensitivity analysis (ESA) and self-organizing map (SOM). It would be clarifying if the authors add a line of why they write about those methods. In the end of the paragraph the authors can add something like this: "We use the ESA and SOM to generate..."

RC4) For many of the figures the axis unit or colorbar unit are missing (Figure 1, 2, 3, 5).

RC5) In figure 2 the abbreviation "LST" is not explained. Please spell out the abbreviation.

RC6) It would also be nice if you set a title in figure 4 and 7 indicating that panel a) corresponds to the Colombia River basin and panel b) is the Colombia River Gorge, and also something in the figure indicating that the figure corresponds to either local gradient or large-scale features. This applies for many of the other figures as well. It would be easier to follow if the figures had a title indicating of the figure is related to the sea breeze or the cold-front case.

RC7) Line 105: Add the abbreviation NARR behind the "the North American Regional Reanalysis".

RC8) Please add the the resolution of the reanalysis (NARR).

I found this at NCEP's homepage describing the NARR reanalysis: "The grid resolution is 349x277 which is approximately 0.3 degrees (32km) resolution at the lowest latitude". Why have the authors chosen to run the outer domain (D1) of WRF at an horizontal resolution of 36 km? If the resolution from NARR and from WRF D2 is almost the same, why do the authors use two domains in their model run?

RC9) Line 135: The authors write "a neighborhood function is applied". Describe what this is.

RC10) In Fig 2a and 2b, how do the authors explain the large differences between the model and the observed wind speed? (please see RC1).

RC11) In caption of Fig 2 the authors write "... across the site locations". Does the "site locations" refer to the 13 observation sites located over the CRG. Please clarify.

RC12) Line 180: "Wind speed differences in the cold-front case broadly spread over the Pacific Northwest and offshore regions (Fig. 2e)." You refer to Fig 2e) for the cold front case. I believe you mean Fig. 2f)?

RC13) Figure 5: label the panels according to the four SOM types: a) Type 1; b) Type 2

etc.

RC14) Line 280: The wind anomalies \textit{are} mostly located...

RC15) Line 281: ``During 18-30 h, the sea-breeze front in type 1 advances from the west to the east, and strong wind anomalies pass through the gorge (Fig. 11a, e, i).'' From the figure, I do see the sea-breeze front. However, I would expect the anomalously cold air to extent offshore. The water cools the overlying air, and this air is driven over land by the local thermally driven pressure gradient. Why is the anomalously cold air only located over land? Please explain.

RC16) Line 341-342: The authors write ``The CRG-based categorization results are generally consistent with those obtained from the basin-averaged analysis. For the sea-breeze case, 81\% of members are categorized into the same types with the SOM clustering based on basin-wide wind vectors. For the cold front case, 75\% of members have the same categories.''

Where does these numbers come from?