Wind Energ. Sci. Discuss., referee comment RC1
https://doi.org/10.5194/wes-2022-48-RC1, 2022

Comment on wes-2022-48

Anonymous Referee #1

Referee comment on "Predicting power ramps from joint distributions of future wind speeds" by Thomas Muschinski et al., Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2022-48-RC1, 2022

Comments on manuscript wes-2022-48 Submitted on 20 May 2022

"Predicting power ramps from joint distributions of future wind speeds"
by

Thomas Muschinski, Moritz N. Lang, Georg J. Mayr, Jakob W. Messner, Achim Zeileis, and Thorsten Simon

The paper describes an improved methodology for the probabilistic forecast of hourly wind speeds on a forecast horizon of one day. Focus of the work is the prediction of power ramps, i.e, the strong increase or decrease of wind power over a time window of one or more hours. Basis of such predictions is typically an ensemble of physics-based numerical wheather predictions (NWP), which is the transformed into wind power predictions using idealized wind turbine power curves.

The authors address the temporal multi-point correlation structure of wind speeds and their forecasts as one crucial problem to improve probabilistic forecasts. Together with existing methods they introduce their own approach to explicitly model the joint multivariate distributions of hourly wind speeds with respect to their mutual temporal dependencies. This new approach of Multivariate Gaussian Regression (MGR) has previously been published in a journal on statistics and econometry, and is consequently described only shortly.

The main part of the paper performs a detailed comparison of the

various methods at the example of one power ramp event measured at the German FINO 1 platform in 2019. The proposed method of MGR outperforms the other appraoches in the comparison.

The paper addresses a highly relevant problem in wind power forecasting, namely the so-called power ramps. Moreover, with the temporal multi-point correlation structure of wind speeds the authors address one of the central and most demanding challenges of the field and of atmospheric flows in general. Their approach is promising and the given example is convincing.

Technically, the paper is well written and well readable. The structure is clear and comprehensive. English language style is fluent, precise, and, as far as I can say, correct. Results are presented clearly and with very appropriate graphics. References are given whereever necessary.

The reviewer is an expert neither in NWP nor in the advanced mathematical approaches of the paper. However, in my eyes this paper makes an important contribution, and it is almost ready for publication.

General remarks:

The demonstration of the proposed method using just one single example of a power ramp is quite limited. However, given the length of the paper of already 20 pages, more examples do not seem to make sense. Could the authors comment on the performance of the method for more examples, or, elaborate on possibilities of a wider evaluation?

Specific remarks:

P. 3 L. 85: The bi-linear interpolation between grid points is assumably widely used and probably also accepted. However, it is knwon to reduce fluctuation amplitudes. It would be helpful to have any estimate to what extent that effect is present for the given case.

Technical remarks:

P. 3 L. 77: The phrase "but observations generally far from zero" does not seem to make sense. Please double-check.

P. 17 L. 355: Inserting a "that" after "ensure" would be helpful, although (to my understanding) not strictly necessary.