Review – Bodini et al – HRRR Toolkit

Recommendation: Accept with minor revision.

Overall: This manuscript is a very important study in its description of the HRRR MET Toolkit dataset capability. It is unique in its use of over 20 hub-height wind observation locations across the US in evaluating the newer HRRR MET Toolkit vs. the previous WIND Toolkit. The manuscript will be improved by adding two references to previous studies comparing HRRR data to WIND Toolkit data. Most of my comments below are appreciation for specific aspects the manuscript. I found it to be a clever idea to repackage the HRRR datasets into a common format with WIND Toolkit and include interpolation to the needed hub-height levels. This study is also very relevant to the wider modeling community in using a few dozen observation locations (Table 2) for hub-height wind validation against both WTK and HRRR. I had not seen such a wide collection before of hub-height wind data. This study is a very strong improvement over previous WFIP studies with detailed terrain variations (e.g., Columbia Gorge) and subject to significant data representativeness issues comparing a single profile with 3-km grid data.

I assess the dataset described as excellent in all 3 categories: uniqueness, usefulness, and completeness. I assess the data quality as excellent, and the presentation also as excellent.

Specific comments

The new HRRR Toolkit manuscript definitely needs to mention these two references below describing prior HRRR-based wind and solar energy datasets funded in part by DOE. Both of these studies mentioned earlier comparisons with the WIND Toolkit but for the 2013-2015 period. Therefore, they anticipated the new DOE NLR transfer to the HRRR Toolkit now described. Both studies (2018-offshore, 2017-land) used 80-m AGL winds. Obviously, the additional levels provided in the HRRR MET Toolkit data give a much more complete dataset for wind energy studies. James et al. (2017, 2018) both used the 2013-2015 period of the HRRR including before it became operational with NCEP in September 2014.

1. James, E.P., S.G. Benjamin, and M. Marquis, **2017**: A unified high-resolution wind and solar dataset from a rapidly updating numerical weather prediction model. *Ren. Energy*, **102**, 390-405. https://doi.org/10.1016/j.renene.2016.10.059

2. James, E.P., S. Benjamin, and M. Marquis, **2018**: Offshore wind speed estimates from a high-resolution numerical weather prediction model forecast dataset. *Wind Energy*, **21**, 264-284. https://doi.org/10.1002/we.2161

L145-140. On use of a short-range forecast (f01 or f02) instead of f00, James et al (2017) explain the reasoning and would be a much better reference than VCE (2024).

L63-68. I also commend the co-authors on following guidelines from the ESIG (2023) study on best practices for energy datasets. NLR is following thinking from the larger community represented by ESIG.

L165. Great idea to also use other times valid at the same time to fill in the entire 2015-2025 dataset.

L205-206. This sentence gives the impression that the BC was going to be effective, but section 6 shows otherwise. Of course, since there is no known advantage of WIND Toolkit data vs. HRRR without BC, it seems better to leave HRRR as is. The wording in L17-21 makes it clear that BC provides marginal benefit at best and degrades performance in complex terrain. I suggest changing the wording to "… and the WIND Toolkit to consider the effectiveness of the BC approach as discussed in section 6."

L249, Table 2. It would be useful to add columns for land/offshore and for offshore stations, add the number of km offshore the site is. Many of them appear to be very close to shoreline.

L401-430 (Conclusions). I found these conclusions to be excellent, including the different sources of uncertainty including observation representativeness. Well done to the authors in testing bias correction (BC) and concluding that it did not help the HRRR Toolkit data overall. This test is a key point in the paper and will hopefully ensure that users of HRRR Toolkit data won't try to apply BC themselves since it has already been tested.

I note that the HRRR Meteorology, Energy, and Transmission (MET) Toolkit does not mention wind, so is it possible that it will be applied in the future also for solar data? If so, I strongly recommend use of 0-h solar radiation data from HRRR (not 2-h) as shown in a recent paper evaluating HRRR solar radiation forecasts by Benjamin, Turner, et al. (ttps://doi.org/10.1175/MWR-D-25-0094.1)

Technical corrections

L131. Suggest calling the HRRR a "forecast model" or "forecast capability". It is not a forecast itself.

Overall – I found virtually no typos – very well done.