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Interactive comment on "Year-to-year correlation, record length, and overconfidence in wind resource assessment" *by* Nicola Bodini et al.

Nicola Bodini et al.

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Response to Referee 2

We thank the referee insightful comments following a thorough reading of our ms.

RC2: I think it would help the article to clean up the abstract a bit...

Authors: We agree with all the reviewer's points and have substantially revised the abstract. Our revised abstract now reads as follows:

Interannual variability of wind speeds presents a fundamental source of uncertainty in preconstruction energy estimates. Our analysis of a set of long (62-year) wind-speed records from 60 stations in Canada shows that deviations from mean resource levels persist over many decades and make actual uncertainty 2-3 times larger than

expected. For example, the performance of each site's last 20 years diverges widely from the P50 level estimated from its first 42 years: half the sites have either fewer than 5 or more than 15 years exceeding the P50 estimate. In contrast to this 10-year-wide interquartile range, a 4-year-wide range (2.5 times narrower) was found for "control" records where statistical independence was enforced by randomly permuting each station's historical values. Similarly, for sites with capacity factor of 0.35 and interannual variability of 6%, one would expect 9 years in 10 to fall in the range 0.32-0.38; we find the actual 90% range to be 0.27-0.43, or three times wider. The presence of serial correlations favors a shift from a climatology-focused approach to a persistence-focused approach: for this dataset, no improvement in P50 error is gained by using records longer than 4-5 years, and use of records longer than 20 years actually degrades accuracy.

RC2: Pg. 1 Line 23: You mention you sidestep the instrumental and model factors. It was unclear to me how this was done at this point in the paper. Later it is clear this was done using Wan et al.'s dataset, which homogenized the data, but I think it would be good to mention this earlier.

Authors: The main point we were trying to make here actually does not refer to Wan's homogenization of the data. We have revised this paragraph to indicate that, by predicting simply just the same variable that has been measured (anemometer wind speed), we avoid the additional uncertainties associated with modeling flow over complex terrain, turbine availability, and so on, that complicate full resource assessments but that do not relate to wind's predictability. The revised text reads as follows:

To avoid uncertainties associated with the full energy assessment, such the modeling of flow over complex terrain, extrapolation of wind speeds to hub height, wake losses, turbine availability, and so on, we analyze only the extent to which historical anemometer measurements can be used to predict future ranges of the same anemometer measurements. (We convert anemometer measurements to modeled turbine capacity factor just to give an appropriate variability scale.)

RC2: Pg. 2 Line 63: I think you should mention that they are monthly averaged wind speeds here.

Authors: we have inserted the word "average". The text now reads, "We base our analysis here on one of the longer observational datasets of instrumental wind speed records available, a 62-year (1953–2014) record of monthly-average wind speeds from 156 Canadian meteorological stations (Environment Canada, 2016)."

RC2: Pg. 3 Lines 28-35: You mention using annual averages to avoid seasonal effects, but you then null missing months. There should be a discussion about the distribution of missing months across the year. In Canada, one could imagine that there are more missing data in the winter than the summer due to the climate, but how this might impact the data is significant. Additionally, information about how the missing years relate to the validation 20-year period compared to the fitting 42-year period may also be of interest to the reader.

Authors: We appreciate the reviewer's point about the significance of averaging over possibly non-uniform distributions of missing months. We have accordingly revised the method by which calculate a station's annual resource-level average for years in which one or more monthly data values are missing. To describe this revised method, we have added after the original sentence, "To deal with data gaps, unavoidably present in such an extended dataset, we assign null weights to missing monthly data," the following new text:

Furthermore, for each station we calculate an average seasonal cycle as the average of all the Januarys, all the Februarys, and so on (for both wind speed and modeled capacity factor) over the station's 62-year record. In years where our annual average is calculated from less than 12 data points, we make an adjustment according to the fraction the available data represent of the average seasonal cycle.

RC2: Pg. 5 Lines 80-82 & figures 6 & 10: The Binomial distribution is a discrete distribution, yet you mention that the exceedances take values outside of that distribution

due to your weighting and plot smooth curves on the plots mentioned above. While this shouldn't influence your findings you should correct it to properly represent the distribution.

Authors: We have revised figures 6 & 10, as shown, to more explicitly show the discrete nature of the binomial distribution.

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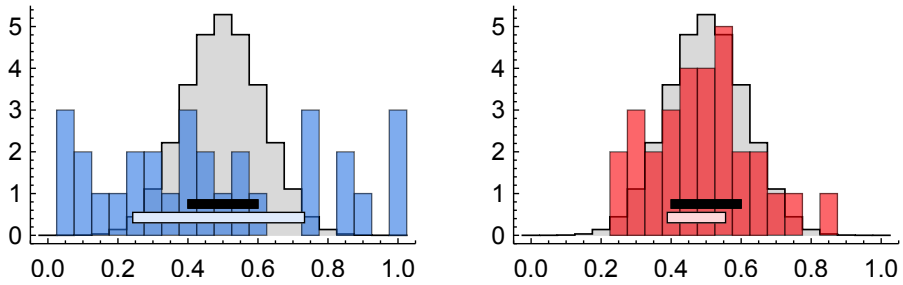

Fig. 1.

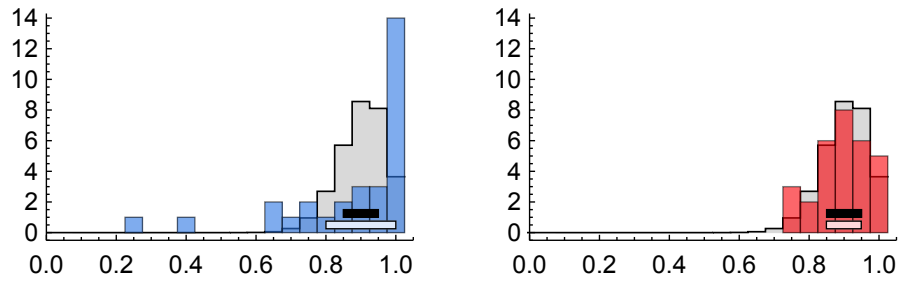

Fig. 2.