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Comment on nhess-2022-12

Anonymous Referee #3

Referee comment on "Using high-resolution global climate models from the PRIMAVERA project to create a European winter windstorm event set" by Julia F. Lockwood et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2022-12-RC3>, 2022

This study creates and analyses a winter wind storm event set for Europe using the PRIMAVERA multi-model ensemble. Therefore, tracks of extra-tropical cyclones are used to generate footprints of windstorm events for the model ensemble as well as ERA5 reanalysis data. Bias adjustment is applied to estimate 3-s wind gusts out of the daily maximum model output, whereas two different bias adjustment approaches are assessed. By means of the calculation of a loss index, the distribution of losses, return periods, clustering, and relationship with NAO are investigated.

The manuscript is well structured and provides an event set which is worthwhile to be analysed for loss estimation of European wind storms.

With respect to two paragraphs the manuscript reads as it had to be finalized in a certain time frame. The authors write that it was not possible to work on issues concerning the tracking method for ERA5 as well as for some PRIMAVERA simulations. This is not a scientific argument. I suggest to better explain why the data is used as it is and why the whole study is not sensitive on the issues of the tracking method which led to a reduction of data.

Nevertheless, I suggest to publish the work after minor revision.

Minor comments

L 40: Can you provide a reference for this definition?

L 58 ff: you are describing the use of dynamical models to generate event sets. Disadvantages are e.g. coarse resolution of the models with all its difficulties and pit falls (too zonal storm track, too small latent heat release, etc). But you are also mentioning the WISC event set and studies using ensemble prediction systems where the horizontal resolution is comparable to the used PRIMAVERA models. Can you explain the reason and advantages of using your model ensemble in comparison to those studies?!

L 124: see first comment. There is no reference for this definition.

L 137: what does it mean if you are writing that track were unavailable at the time? Are the tracks provided by a computing center? Couldn't you perform the tracking by yourself?

L142: you are mentioning the definition of the footprint again and arguing that you want to comply with industry standard. Reference would help

L 143: what is the reason for exactly this definition of the domain?

L 146: what does „central day of the 72h period“ mean? Is it 36h before and 36h after this day? If this is the case, this information is very important. Please use this shortly, when mentioning the 72h period and the connection to a cyclone track the very first time. I was wondering before how to connect a 72h period to a cyclone which lives for a couple of days.

L 185: I am wondering about the time frame you had to finalize your study. In how far the results are influenced or biased by this reduced set of 12 winters?

L 192ff (Fig 2): I do not understand how the mask is calculated you are using to separate footprints. Since you are writing to consider gridpoints less than 1500km away from the cyclone track, I expect an area (tube shape) around the track. That seems not to be the case. Can you explain why?

L 206: does this reference define footprints as 3-s gust over 72h? This would be important to use earlier as commented before.

L 209: At L 133 you are writing to use hourly maximum gusts of ERA5. Are those representative for 3-s gusts since you are using this as „observations“

L 268: What is the source for your population density?

L 292ff: The comparison is done on the same grid, isn't it? Model wind speed is statistically downscaled to the ERA5 grid. Can you explain the mechanism why the coarse resolution underestimates LI?

Do you have an explanation why the resolution effect is cannot be seen anymore for severe footprints?

L 335: it is hard to compare the distribution of ERA and PRIMAVERA especially for high LI values. Would it be beneficial to use CDF? Additionally it has the advantage to be independent of bin width.

L 343: Return periods for ERA are not calculated with a GPD fit but empirically, isn't it? That means that the most intense season (which is 89/90) has return periods of the length of the time series, i.e. 35 years. Maybe it is worth to shortly explain this just to avoid misunderstanding.

L 345: I do not understand the return periods of the unrealistically extreme events (open circles).

L 455ff: there are different uncertainties for the use of the empirical method or the GPD for the bias adjustment. Is it possible to take this into account when calculating return periods in Fig 7? The confidence interval in Fig 7 is just due to the GPD fit of the PRIMAVERA LI data but the uncertainty to calculate the LI is not taken into account. At least it would be worth to discuss it.