

Review of Using seasonal forecasts to enhance our understanding of extreme wind and precipitation impacts from extratropical cyclones, by J.W. Maddison et al.

This is my second review of the paper.

The authors globally answered my queries. I just have a few minor remarks.

We thank the reviewer for taking the time to review our revised manuscript. In the following, the reviewer's comments appear in black and our responses in blue.

I. 68-72: I do not see the rationale (for Guy Carpenter or insurers) for using the SSI as a proxy for losses, when loss data is available to them, especially when it is acknowledged that SSI is not a perfect estimator of losses. I do not see a problem for using SSI, though, from the meteorological point of view. The paragraph could be rephrased.

The SSI is used in the industry to estimate losses from hypothetical storms simulated in models, whether statistical or dynamical. We have added "and are used routinely by insurers and reinsurers as a proxy for insured losses from hypothetical ETCs simulated in models" to this paragraph to clarify this.

It just occurred to me that the authors never show cyclone tracks or footprints. What do unseen storms (with unseen impacts) look like?

Thanks for pointing this out. We compared the footprints for the unseen storms to the remaining footprints and found no clear differences in the footprint or storm structure. The storm footprints that produced unseen impacts were those in which the region of highest winds happened to cover a large portion of the country of interest. We have added "We found no clear differences in the structure or footprint of the unprecedented storms (not shown), rather extreme impacts were caused by the chance occurrence of the region of strongest winds covering the country of interest." to the revised manuscript.

I. 154: the definition of Ω is unclear. The sentence should be rephrased: Ω cannot be at the same time a set and a subset of this set.

Thanks for spotting this typo, one should have been an omega. This has been corrected.

I. 189: "which is by definition an extreme event". This is a statistical definition (i.e. taking the largest value), but might not be meteorologically relevant. I doubt that insurers care about small statistically extreme events.

The storm with the highest precipitation impact metric in ERA5 will undoubtedly be impactful (assuming at least one storm has caused precipitation impact in each country in the ERA5 period), so any storm identified with a greater precipitation impact value will be of interest to insurers.

I. 310: I am moderately convinced by the explanation given by the authors on the "strange behavior" of SSI distribution for Finland. The reason they give should also apply to Sweden.

There is a positive bias in the number of storms in GloSea for southern Sweden, whereas the bias is negative across Finland, explaining the differences between these two countries.

Section 6. I am moderately convinced by the GPD analysis reported in this section. The GPD parameter could be reported (e.g. in a supplementary document, or in Table A1).

We provide some more information about how the GPD fits were computed.

For each country, we have the list of SSI values for each storm day. We first remove invalid and negative values in the SSI time series. Then we specify the time length of the series which will be 51 years (1972 to 2022 inclusive). The missing days (where there is no storm) are filled with zero.

Then, we use a peaks-over-threshold approach where, from the SSI series, we calculate the 85th percentile value of non-zero SSI's, and then apply the GPD fit function with the specified

threshold and year span (51 years). We repeat this for 19 other thresholds that correspond linearly between the 85th to 95th percentile value of non-zero SSI's. This results in 20 GPD fits per country, then we compute the median, 2.5th & 97.5th percentile of these 20 GPD fits.

The key parts of this information are in the main text.

I. 401: I do not understand what “The historical storms in ERA5 are extrapolated using a GPD [...]”.

A GPD is used to model the tails of a distribution statistically, based on univariate extreme value analysis. We have added a reference here for the interested reader.

I. 411: I do not understand the explanation why “the return value curves do not all start the the same point [...]”. The abscissa of the first point only depends on the time increment (i.e. days), not the value of the time series (or the threshold).

The first point is only plotted when the SSI is above zero, i.e. when the winds exceed a certain threshold that is country specific. The amount of storms that do not have winds exceeding this threshold therefore varies by country and results in different return periods for impactful storms. This has been clarified in the text.

Figure 8 yields many issues. Why is there a “break” in the lines of the AT and GB orange lines (between 1 and 10 years)? The correspondence between the orange and black lines (Fig. 8c) for GB is not that great, despite the fact that GB cannot be considered as a mountainous region (unlike AT).

The orange and black lines the reviewer refers to with breaks are not in fact lines but made up of crosses (one for each storm). Breaks therefore occur when there is a larger jump in SSI between two return periods, given we have a limited set of storms this is expected. Differences in the orange and black points do not only occur in mountainous regions, biases in GloSea6 will also lead to discrepancies.