

Review of 'Identification of high-wind features within extratropical cyclones using a probabilistic random forest - Part 2: Climatology over Europe' by Eisenstein et al. submitted to Weather and Climate Dynamics

We would like to thank the reviewers and editor again for their review of our manuscript. Below we addressed the remaining comments of Reviewer 1 in blue. Text changes are included in italics when suitable. Line numbers correspond to the revised manuscript.

General comments:

This is my second review of this interesting study describing the results of applying a methodology previously published by the authors to develop a 19-extended-winters climatology of mesoscale wind features in cyclones over Western and Central Europe. The authors have responded to my earlier questions and concerns very thoroughly, including making appropriate edits to the paper. I have no further concerns relating to my original review. In reading the revised paper I spotted a few rather minor language edits and science clarifications that should be considered and these are listed below. I recommend that the paper is accepted for publication after these comments have been considered and I look forward to seeing it in Weather and Climate Dynamics.

Minor specific comments:

Rebuttal letter On p4 of your rebuttal letter you examine the robustness of your findings by, amongst other things, considering subsets of winter seasons. In the description in the rebuttal letter and caption of the associated figure, FR3, you say that 10 randomly chosen seasons were considered, however in the text added to the paper (which is also repeated in the rebuttal letter) you say that nine seasons were considered. Which is it?

We are sorry for the confusion; nine seasons is correct as written in the manuscript.

L38 I suggest changing "this feature" to "the CFC feature" for clarity (in my first reading of this sentence I thought "feature" referred to the bent-back front mentioned in the previous sentence).

We changed this to "CFC": "*Considering recent cases of Shapiro-Keyser cyclones (e.g., Egon 2017, Xavier 2017, Friederike 2018; see Eisenstein et al., 2022a), CFC appears to be more common following the Norwegian cyclone model (Bjerknes 1919).*"

L60 By "features" here do you mean the storm tracks over the North Atlantic and North Pacific? This could be written more clearly.

We changed this to "region": "*While the two first regions are identified for all methods, the maximum over the Mediterranean is dependent on the resolution of the used data set and methodology used.*"

Section 2.1 It would be useful to add the source of the observational data set here, as stating that the observations are only available over land (which I think is true). The source is stated in the data availability section of both parts of the paper but it would be helpful to repeat it here as well.

We added this accordingly: "*The observational data set provided by the German Weather Service includes hourly surface observations over land from 2001 to mid-2019 [...]*" (l110)

L136 I appreciate that you showed in your rebuttal letter figure FR5, a figure that used the same domain for the COSMO-REA6 data as for the observational data, for comparison with Fig. 3a–h in the paper. As you still use different domains for these two datasets in the figures shown in the paper it would be helpful to note this in the paper and say briefly why you chose to use the different rather than consistent domains.

We added the following at the end of Section 2.2: “*Note that the area shows an eastward extension and a northerly shift compared to the observational data set to include more northern regions affected by winter storms, where the observational data are sparse.*” (l138)

Section 2.4 It would be useful to add here if there is a constraint on the minimum length (in time or space) of the cyclone tracks.

We added this information to the text: “*Cyclones must travel at least 1000 km and last for at least one day to be considered.*” (l188)

p10 Consider combining some of the 3 short paragraphs near the end of this page.

We rearranged the paragraphs to combine the first (“*Finally, Fig. 3m-p [...]*”) and third (“*To examine how [...]*”) as they are both considering the same data, while keeping the second (“*As the overall frequencies [...]*”) as is.

L374 & 401 Gentile and Gray (2023) didn’t introduce the term CCBa, it was used previously by Earlet al. (2017). I don’t know whether Earl et al. were the first to use it though.

Indeed, that is misleading. We added the reference to Earl et al. in the introduction and corrected it in Section 3.3.:

“*[...] Gentile and Gray (2023) distinguish between the CJ travelling against the system motion (named CCBa) and the CJ wrapping around the cyclone centre (CCBb) following Earl et al. (2017).*” (l91f)

“*The northern part of this patch is located in the area of the warm front and is possibly connected with the CCBa as discussed in Earl et al. (2017) and Gentile and Gray (2023).*” (l374)

“*As mentioned above, the area northeast to north of the cyclone centre, which does not overlap with any of the mesoscale features, corresponds to the CCBa as described in Earl et al. (2017) and Gentile and Gray (2023).*” (l402)

Technical errors:

L95 “cause” → “have” (otherwise you are saying that winds cause winds!).

This has been changed accordingly.

L129 I would say “at 10m” etc. (rather than “in 10m”); this applies three times in this sentence.

This has been changed accordingly.

L163 “characteristics in other...” → “characteristics of other...”.

This has been changed accordingly.

L164 “different” → “differently”.

This has been changed accordingly.

L243 and elsewhere To be horribly pedantic, “less” should be “fewer” here (if you can count the items you should use “fewer” whereas you would use “less” for an amount, e.g., less time).

We are sorry that we missed some. We changed this in lines 219 and 243.

L333 “they might” → “it might” (because frequency is singular) or say “as WJs might”

This has been changed accordingly.

L429 What does “they” refer to here? Strong winds?

It refers to the features. This has been clarified.