

# ***Interactive comment on “Spatial variability and potential maximum intensity of winter storms over Europe” by Michael A. Walz and Gregor C. Leckebusch***

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We would like to thank the reviewer for their valuable comments on our study. In the following we would like to address every comment individually and present our opinion and also indicate changes that have been made.

(1) The study uses regions (SC, CE) that are not shown nor described in terms of position and size (section 3, p.4). Additionally, the choice of the regions is not motivated.

We have added a figure that shows the circles around all the regions as a supplement. Furthermore we have added some description on how the radii were defined. Basically

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it is just choosing the “centre” of a region and selecting a radius to encompass the respective country/area.

(2) In section 4.2, p.9 one figure is referenced that is not in the paper. The reference was amended accordingly.

(3) Sections 1, 2, 4.1, 4.2 and 5 must be divided into paragraphs to make them readable. There was some Latex formatting error, apologies for that. Paragraphs have been added to the entire manuscript.

Other comments: (4) Sentence 2 of the abstract should be deleted because it does not express what you have done in the study. The sentence was deleted, the entire abstract was revised also.

(5) p.1, line 15, 16: From my understanding, "somewhere" and "about" sound a bit too sloppy to describe amounts of losses and casualties. There should be a more exact reference. Fully agreed, deleted the two words. Overall we are trying to be more precise.

(6) p. 3, line 8: I find "years" confusing in this context. We have changed it to winter seasons. Of course it is not years per se

(7) p. 3, line 9, 10: What do you mean by "observational" reanalysis data? This was to stress that we consider reanalysis as observations, despite them being a model as well. Removed the observational in order to avoid confusion.

(8) section 2: What times/time resolution of the data set have you used? Added the description on time resolution (6-hourly data).

(9) Fig. 1: What is the unit and the depicted level of the wind speed? Added the description in the legend. We used 10-m wind speeds in m/s.

(10) Fig.1: Here, you could show the circles for all regions. We think that the plot would get too busy here. We have added a figure in the supplementary figures to show the

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circles.

(11) p.4, line 1: As above, replace"years" by seasons. Done.

(12) p. 6, line 21: In the beginning of the main section: What are the "other two regions" here? The other two regions are Scandinavia and Central Europe. The latter is quite similar to Germany and the Benelux, it includes France additionally. Please refer to the figure in the supplement.

(13) Fig. 2,3: The red circle is hardly visible, can you draw it on top of the trajectories? As we have added an additional figure we hope that this suffices as reference to where the circles are located.

(14) p. 9, lines 5ff: The heights of the bar figures 4,9 and10 are barely comparable among the panels. A number on top of each bar could help,or a finer resolution of the horizontal lines. In addition, there is the unit missing for the return period.

(15) p.9: Same as above: The long text needs some paragraphs. Done.

(16)p.9, lines 26ff: How are celerity and duration defined, how are they used to construct Fig. 5? Some description was added on page 6 lines 30ff. Celerity as the translational speed between two 6-hour time steps and the duration in days, thus number of 4 time step blocks in the tracked windstorm.

(17) p.9, lines 34ff: This can not be understood without the figure. The comparison with the other region was removed. This part was remaining from a previous version of the manuscript. Apologies for that.

(18) p.9,line 32-34: This statement is related to which region? See above. Removed that statement.

(19) p. 10, line 1ff, Fig. 6,7:How exactly are the composites constructed, which times of the windstorm are used? There is some description around lines 33ff on page 6. All time steps of windstorms for a respective cluster are averaged to create the

composites.

(20) Same, more scientific: What do you want to address with the composites? Your argumentation goes in two different directions: Do they represent the cyclone related to the windstorm or the steering flow responsible for the trajectories? For the steeringflow the 700hPa geopotential is a more appropriate field. Still, the composites show a climatological picture. Are the windstorms of smaller scale embedded somewherein the Icelandic low? Then, it would be interesting to show them as a disturbance field or high frequency field where the climatological low pressure system is subtracted. If there are multiple time steps for each cyclone/windstorm you could consider to use only one each, e.g. the most intense or the one when entering the region. Please revise this paragraph.

We appreciate the comment and see the valid point here. Due to data availability and facilities we are unfortunately not able to do further analysis on other data fields. We rephrased the paragraph so that the MSLP composites can be seen as a “proxy” the steering flow. As they indeed show the correct flow conditions when assuming a geostrophic wind. We hope that this answer is satisfactory for the reviewer.

(21) p. 10, line 26: Delete the "a". Done.

(22) p. 10, lines 29 till p.11, line 5: This section is too long. What about drawing a marker at the beginning of the windstorm identification above each trajectory? We shortened the paragraph. We believe the markers would make the “spaghetti plots” even more busy so we decided not to add markers.

(23) p. 11, table 2: Is there a physical reason why the Germany/Benelux region should be affected by a potentially deeper cyclone than the British Isles That is a valid point however one has to keep in mind that these estimates are purely based on statistical assumptions within the extreme value theory, thus they are probably not “physical” meaningful any way. If you look at the return period plots it is obvious that cyclones affecting the BI are considerably deeper than the ones for CEBE. Added this to the

manuscript as well.

((24) section 4.2 and Fig. 10: Wouldn't it be more meaningful to show the statistics of the wind speed instead of cyclone curvature? Decided to transform the curvature to a version of the Rossby number to show the extremeness of the cyclones with regards to the curvature.

(25) p. 12, line 11: Again, you do not have 1500 "years" of data. Change it. See above

(26) p.13, lines 3-5: How is that meant? This sentence was a remainder from an earlier version of the manuscript and was thus removed.

(27) p.13, line 3 16,17: What do you mean: "cyclones ... are ... lower"? Should have read deeper. Changed it.

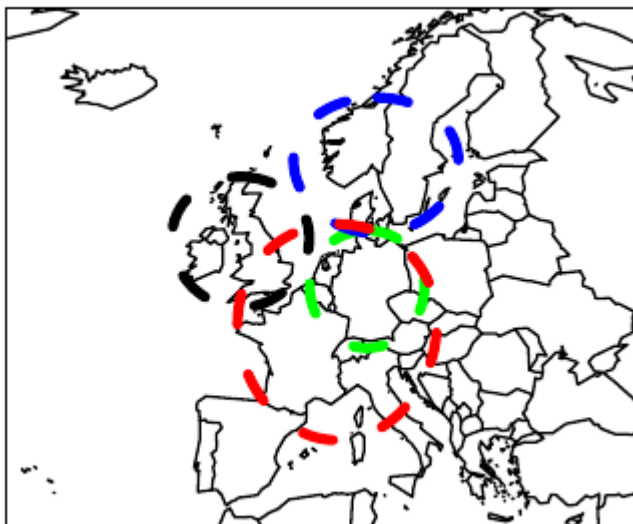
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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2018-309>, 2018.

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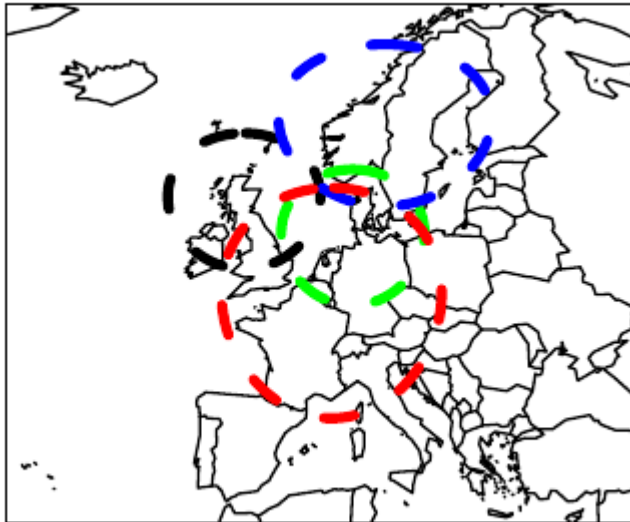
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**Fig. 1.** Circles to define the areas through which a windstorm has to pass for the respective regions. Black for the BI, green for GEBE, blue for SCAN and red for CE.

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**Fig. 2.** Circles to define the areas through which a cyclone has to pass for the respective regions. Black for the BI, green for GEBE, blue for SCAN and red for CE.

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