

Interactive comment on “Variability of daily winter wind speed distribution over Northern Europe during the past millennium in regional and global climate simulations” by S. E. Bierstedt et al.

Anonymous Referee #1

Received and published: 8 June 2015

General comments The manuscript aims to link variability of wind speed distributions to the variability of regional mean temperature, temperature gradients and the NAO. Therefore, climate simulations of GCMs and RCMs as well as reanalysis products are investigated. The scientific idea is legal and a possible disentangling of the driving parameters would help the community. However, two out of three GCM simulations are driven with changes in land-use, which seems to have the overwhelming effect. Hence, the authors state themselves that correlations established with the temperature in the first part of the manuscript are “a statistical artefact mediated by deforestation”. Therefore, unfortunately, my conclusions is that the questions raised cannot be answered with the chosen simulations.

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Specific comments P 1484, I 24: The introduction refers mainly to extreme wind speeds, which I understand as the maximum wind speed within a certain period. However, you use daily mean winds. I would like to see the statistical relation between daily means and daily extremes as the maximum daily gust.

P 1486, I 11: The description of the MPI-ESM lacks the description of the ocean component.

P 1487, I 26: What do you mean with “the same nudging technique”? Do you mean it is the same as in NCEP/NCAR?

P 1488, I 1: How large are the model domains of both RCMs? Perhaps, an overview map would be nice to illustrate the model domains and the study area.

P 1488, I 17: You average over the entire selected area as far as I understand. I am a bit concerned about the impact of the ocean and the corresponding land-sea-mask (see comments below). How would your results look like if you distinguish between land and ocean points?

P 1488, I 18: The explanation of the computation of the temperature gradient (P 1489, I 1-3) should be moved to the end of this sentence. Moreover, why do you use absolute values for the gradient? You cannot exclude situations when the temperature gradient is reversed and that will be hidden by the use of absolute values. In addition, what is the impact of the ocean for tGrad? About one third of the northern boundary is located over the North Atlantic which is characterized by positive temperature anomalies compared with the rest of the domain during winter.

P 1488, I 20: How are the results affected by the running mean computations? How strong are the statistical relations for yearly values?

P 1489, I 4: It is not clear to me how you compute the NAOI. I guess you do not use the global fields from the GCMs, or? How did you compute the NAOI for the RCMs where the model domain might not even cover the Azores?

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P 1491, l 6: Figure 1c) clearly indicates that the correlation is opposite over land and the ocean. Therefore I wonder about the prescribed ocean temperatures. I guess they are taken from ECHO-G. Consequently, you might see a similar response over the ocean. More general, it might be interesting to see the correlations of table 2 split into ocean and land points. By doing that, you would also get correlations that are almost independent of the forest cover – namely the ones over the ocean.

P 1491, l 15+19: Shouldn't it be P95 and P99?

P 1493, l 16: The last two lines of table 2 do not show the relationship of the NAO and the mean temperature. I think table 2 is not complete, e.g. NAO-P95 is missing.

P 1495, l 3: P99-P50 is not shown in table 2. However, there is diffM (P95-P50) which supports the statement.

P 1495, l 6: What is the impact of the land-sea-mask for the GCM results? I think the Baltic Sea and especially the connection to the North Sea must lead to a very odd land-sea-mask since the ocean cells are very large. Perhaps, the agreement between the GCMs and the RCMs would be larger if you consider the land-sea-masks. In any case, I would like to see the land-sea-masks of all considered simulations.

P 1495, l 16: Do you refer to Table 2?

P 1495, l 20: You do not show results for P99-P50. Therefore, I am not sure whether you refer to table 2 or one of your figures.

P 1496, l 5: As stated before, different land-sea-masks in the different setups might play a crucial role.

P 1496, l 20: The “different spatial fingerprint” might be caused by different coastlines.

P 1498, l 20: The value is not bold in the table. So, is it significant?

P 1499, l 14: Information from Fig. 5 is not really used. Two out of the three time series can be found in Fig. 6 as well. Since a more detailed comparison between the curves

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of Fig. 5 is not done, you might skip this figure.

P 1499, l 16: I see an increase of both parameters over the last 250 years, at least. And that corresponds to a period of constant temperature rise in the ECHO-G simulation.

P 1500, l 15: Yes, it seems that the land-use changes have the main impact. That makes large parts of the manuscript irrelevant. There must be control simulations available (some without any variation in the forcing). It seems they would serve much better for your investigations. Why did you use transient simulations?

P 1501, l 8: “The study is based on correlations...” But, large parts of the correlations seem to be controlled by deforestation. My feeling is that it is hard to draw any conclusion from table 2, which is the main object of this manuscript.

P 1503, l 14: An extreme refers in your manuscript to daily means. Most people might think in terms of maximum gusts. That should be clarified.

Section 5: I miss the relation to previous work. I count only two references for the entire section “Discussion and conclusions”. You should at least compare to the studies mentioned in your introduction, e.g. Fischer-Bruns et al. (2005). Clearly, I see the need to discuss the role of the ocean (prescribed or modelled) as well as the land-sea-mask.

Table 2: Something seems to be missing in the table. What about NAO-P95, NAO-P99, NAO-diffM, NAO-diffE? Moreover, you mentioned in the text the relationship of NAO-mTemp and NAO-tGrad, which are not shown in the table.

Figures 1-4 are rather small. It might be possible to rearrange them so that every single figure becomes larger. You could try to order them as: upper: three GCMs middle: two RCMs lower: two reanalysis

Caption of figure 7: The abbreviations P1 and P2 as defined in this caption are not used in the text. Moreover, it becomes confusing with the abbreviations introduced in the text (P 1500, l 22).

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Technical corrections

P 1496, l 23: The sentence sounds strange and needs to be rewritten. You might want to use a formulation like ECHAM6 is the latest version of the ECHAM series/family.

P 1498, 6: "mTemp and P50", please refer to Figure 1f+g) Moreover, move you reference to figure 2 from the of the sentence behind "STD field".

Interactive comment on Clim. Past Discuss., 11, 1479, 2015.