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Schade, N.H.

“Evaluating the atmospheric drivers leading to the December Flood 2014 in Schleswig-Holstein, Germany”

Content:

The author presents a study to estimate the atmospheric drivers of December flood 2014 in Schleswig–Holstein. Different types of classification methods and indices’ combination (i.e. antecedent precipitation index & maximum 3 –day precipitation sum) as well as trends assessments were used to analyze spatial and temporal variability of flood events. The applied methodology seems to be technically sound.

General comments:

The paper lacks a discussion on the basis and consistency of the chosen indices. There is a lack of hydrological information about the flood. References provided are not the best way to understand hydrological behavior during 21-23 of December 2014 in general. Conclusions present not relevant information about flood aftermath. A large part of the conclusion is devoted to the future plans. The language sometimes is not fluent and the writing should be checked.

Response to general comments: At first, I would like to thank the anonymous referee #1 for the helpful criticism to improve this manuscript.

A discussion on the basis and consistency of the indices will be included in the revised manuscript. However, since it is the first attempt to scale the indices down to the regional level, there is not much information concerning consistency yet. This is in fact part of ongoing investigations within the Expertennetzwerk.

Further, it should be pointed out that this paper was not intended to describe the hydrology in detail since that investigation was already performed by the LLUR/LKN-SH. The focus rather lies on the meteorological information leading to this regionally confined flood event and how well the indices for event precipitation (R3d) and antecedent precipitation (API) can describe the onset of this flood. It was already shown by Schröter et al. (2015) that the indices are well suited to describe the onset of nation-wide flood events. I fully agree, however, that referring to another investigation is not the best way to understand the hydrology. The revised manuscript will include the referred picture (with kind permission of the LLUR-SH) showing almost perfect agreement between regions where API and R3d are exceeding their respective 5-year return periods and inland gauges exceeding highest water levels. Further, a passage will be added concerning gauge data to describe the regional concurrence, as well as in the “Data and Methodology” chapter.

The concluding chapter will be removed of non-relevant information and rewritten according to the focus of the paper. Nevertheless, this work is a starting point for further investigations (or future plans) that will include more in depth analyses and, hopefully, provide important information on how climate change is affecting the indices used in this paper. As mentioned before, this is the first attempt to scale the indices down to the regional level and results seem

promising that they might be useful for getting a first glimpse into future changes without the need to run hydrological models (which of course will be the next step for flood protection, adaptation measures, etc.). Therefore, the revised manuscript will include a separate outlook chapter.

Finally, I would like the revised manuscript to be proofread by the editorial office to improve the language.

These are comments (minor), which needs to be addressed before it is accepted for publication:

1.) *P1L28 What is the reason for MIB to be mentioned?*

Response: MIB was mentioned to highlight the various responses to the same cause: Persistent westerly circulation. Also, it was intended to tie the analysis more into the investigations performed within Baltic Earth already and to pique the interest of the community in our work and the work to come. I agree, however, it does not further improve the paper and its purpose. This part would be removed in the revised manuscript, if the editor decides it is of no further interest to the community.

2.) *P1L29 Maybe it's better to use calendar dates*

Response: Calendar dates will be used in the revised manuscript.

3.) *P2L13 Not whole Europe, may be Northern Europe*

Response: The revised manuscript will be changed accordingly

4.) *P6L15 Maybe it's better to provide some assessments of the REGNIE performing goodness then to refer on the figures of the reports*

Response: A Figure and a passage comparing REGNIE to selected observed station data can be included in the revised manuscript.

5.) *P6L26 The end of the sentence "only that not differentiated" is unclear. What kind of differentiation?*

Response: Soil moisture for sand soil shows the same structure, i.e. almost the same values all over Schleswig-Holstein whereas loam soil is clearly wetter in the Northern parts and drier in the South. The respective passage will be rephrased in the revised manuscript.

6.) *P7L6 To name a source of information*

Response: The source of information will be added in the revised manuscript.

7.) *P8L1 A verb (may be “need”) is missing*

Response: Yes, indeed. It will be added in the revised manuscript

8.) *P8L3 “affecting the drainage of affected catchments”. Maybe it’s better to re-write this part of the sentence to avoid unclearness.*

Response: The respective passage will be rephrased in the revised manuscript to avoid unclearness.

9.) *P8L20 Unmistakably is very strong form of certainty. May be it’s better to use another word when talking about the future.*

Response: You’re right; those strong forms better be avoided. Thanks for pointing it out!

10.) *P9L34 References proving additional meltwater runoff in the future are needed*

Response: Admittedly, it was an assumption on my part. References will be included in the revised manuscript or the passage will be rephrased/removed in case of missing references.

11.) *Maps should contain major catchment boundaries (including Kiel channel watershed)*

Response: All respective figures in the revised manuscript will include boundaries of Schleswig-Holstein and the Kiel Canal catchment to make the figures easier to understand.