

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
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Comment on nhess-2021-314

Anonymous Referee #2

Referee comment on "Characteristics of joint heavy precipitation and high sea level events on the Finnish coast in 1961-2020" by Mika Rantanen et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-314-RC2>, 2021

This work presents a joint analysis between sea level and precipitation observations around the coastlines of Finland to investigate the occurrence of compound events that are relevant for coastal flooding episodes. The results are generally well described and presented, although the analyses are sometimes superficial. I am giving some suggestions below, followed by a list of minor issues that I have found in the manuscript. I believe that this work has the potential to be published, after the points below have been addressed.

Section 4.2: why is the timing of the compound events different between tide gauges in the end of the gulfs and those closer to the Baltic? what are the mechanisms explaining this difference? is it because extreme sea levels are caused by different processes in the two areas?

Section 4.3: The idea of the composite maps to investigate the patterns that lead to compound and non-compound events is interesting. But the robustness of the results shown in the maps in figures 6 and 7 should be discussed. Only 27 and 28 situations are used to produce these maps and there is a lack of information about their similarities. I think deviations from the mean fields are needed to improve the interpretation of these results. In addition, to increase the size of the sample I suggest redoing these maps using various nearby tide gauges, instead of only one. This limitation is noted later in section 5.1, but without further development.

There is no information on the predominant month when these situations take place. I guess, from the seasonal cycles in figure 4, that precipitation extremes will dominate in summer and sea level in winter. I wonder if the synoptic patterns of precipitation-only and sea level-only extremes during the fall/winter season are different from those shown in figures 6 and 7, when all seasons are included. I think it would be more interesting to select the season when coincidences are possible; otherwise, what we are seeing is only

the dominant pattern in different seasons.

- 67: please, rewrite the sentence "that have been investigated on the Finnish coast not until the recent decade" as it is hardly understandable.
- 100: on the use of the maximum daily sea levels, is there any difference due to different samplings before and after 1971?
- 111: 21tg to 21st
- 142: the term "orthogonal" can be misleading in this context. If calculated with rotational EOFs over monthly data, NAO, SCA and other patterns are by construction orthogonal to each other (on a monthly basis, not on a seasonal or yearly basis). The meaning of orthogonal here seems to refer to the spatial structure of the MSLP right?
- 170: change were to was
- 214: change are to is
- Figures 6, 7: units are missing from the legends. Also in the caption, what does "average sea level height" means? Is it the average for the particular tide gauge during the selected episodes?
- Section 5.3: this section seems to me more part of the introduction. Just a suggestion...