

Interactive comment on “Classifying compound coastal storm and heavy rainfall events in the north-western Spanish Mediterranean” by Marc Sanuy et al.

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The authors present an interesting analysis of the relatively new concepts of multivariate and spatially compounding events considering the two hazards heavy precipitation and coastal storms along the Catalan coast. Overall the analysis is sound and fits well into HESS. However, some aspects of the methodology are difficult to follow (see comments below).

What is somewhat lacking is a discussion and contextualisation of the results. The current Discussion (L 425-568) can be considered as results and should be moved to the Results section (e.g. under the section headline “Case studies”). An actual discus-

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sion of the approach and results is missing. With the case studies, the manuscript is already quite extensive but maybe the authors could briefly discuss topics such as

- What are advantages/limitations of the approach the authors use to study compound events? How does it compare to other approaches in the literature?
- How would climate change affect the occurrence of this type of compound events in the study area?

Throughout the manuscript: check the usage of the word “verify”. I think the word is used incorrectly and should always be replaced with “co-occur”.

Minor comments:

Abstract:

- 3.4 events per year: difficult to contextualise if the definition of events is not presented. The number depends strongly on this definition.
- Last sentence: On what evidence is this conclusion based? Can you add this information here, please? Further, remove either “damage” or “impact” from the sentence (both mean the same here).

Main text:

L 76: “Spatially compounding events refer to co-occurring hazards from different climate drivers within a limited time window”: maybe add “spatially” between before “co-occurring”

L 144: Is the analysis of spatially compounding events sensitive to the selection of AWS? I.e., if you include less/more stations, would this change your number of spatially compounding events?

L 187: Do you analyse the correlation between driver intensity in spatially compounding events? How? In those events you typically more than two variables. Please clarify.

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L 201: Usage of “significant”: consider using a different word (e.g. “extreme”) since significant is usually only used in the context of statistical testing. Same comment applies to L 215.

L 227: add “heavy” before the second “rainfall”

L 235: I was at first confused about the usage of “areas”. I assume you mean the areas delineated in Figure 2b. If this is the case, please make this clear (e.g. by referring to the figure). In L 237 you use the word “sector”. Is this the same as the areas above? I assume it’s a subset and you’re referring only to the coastal areas. Please clarify.

L 237: The classification of compound events is unclear. Do you mean for each event you go through all the coastal sectors and check whether you have only rainfall or only wave extremes or both? Please make use of the word “extreme” to make clear what events you’re talking about (e.g. instead of “episodes” in L 238). In particular, the phrase “where local extreme conditions correspond to . . .” is unclear. I think you mean something like “if rainfall/wave extremes occur in this sector. Also, the classes are not exclusive. An event can be multivariate, spatially compounding rain and spatially compounding waves. Which class wins?

L 242: See my comment higher up: what do you do when you have more than two drivers in the event?

L 294: remove “the presence of”

L 301 and 302: usage of “location”: do you mean “area”?

L 305: it is not clear what the percentages in this paragraph refer to. Are they relative to all extreme event (i.e. 100% would mean all extreme events are compound events)? Please clarify.

L335: It seems that you pool all events in a given area even when they occur at different station. This should be mentioned in the methods section. It is still not clear how you deal with the case where multiple rainfall extremes in the same area co-occur with one

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wave extreme.

L 358: “statistically independent values”: please replace with “uncorrelated”. A correlation of zero doesn’t mean that the variables are statistically independent (though the reverse is true).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-560>, 2020.

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