Hydrology and
Earth System
Sciences
Discussions

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

Anonymous Referee #3

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This manuscript summarized results from a comprehensive analysis of compound coastal storms and heavy rainfall events in parts of Spain. Two types of compound events are assessed, namely multivariate compounding events and spatially compounding events. The analysis uses a mixture of observational data and model hindcasts, as well as atmospheric reanalysis data to assess synoptic weather types associated with certain compound events. The analysis and results are very interesting and worthy of publication with NHESS. A general comment is that the discussion could use more work as much of it reads more like results (this also relates to my comment below on what the impact of concern is when assessing for example spatially compounding events). Other than that I only have a list of mostly minor specific comments listed

below that should be taken into account before the paper is ready for publication.

37 Berghuijs et al.

40 The way it's worded indicates that Ward et al. considered storm surge and waves which is not true. Marcos et al. is a good reference for that and should be added: https://doi.org/10.1029/2019GL082599

56 I would refer to those as "regional" instead of local

75-82 What about spatially compounding with the same driver, i.e. spatial footprints (as analyzed here for example: https://doi.org/10.1029/2020JC016367), in my opinion that also falls into that category.

99 a bit more discussion about why events like that are of particular interest would be useful, what is the particular impact of concern for both types of events, multivariate or spatially compounding, in the context of this analysis?

165 Was there a particular reason to choose that reanalysis instead of a higher resolution one like ERA5? Do the authors expect all relevant features to be captured at this resolution?

184 "verify" is used several times in the wrong context

219-231 I understand that this would not include events where one variable is extreme and the other one is not (but might still be elevated, though not enough to cross the "extremes" threshold), is that correct? How does that relate to other approaches that are often used, such as two-sided sampling, where each extreme event of either variable is paired with the simultaneous value of the other variable (regardless whether the latter is extreme or not)

252 "correlation-based, gridded map-typing technique" is a mouthful and could use some further explanation.

265 More out of curiosity, do the authors have an idea how this compares to K-Means

clustering?

373 consider changing "generating floods" to "generating rainfall", as sea storms can also lead to floods

Caption of Table 3: should it be Figures 11 and 12?

C3