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Interactive comment on "The role of precipitation for high-magnitude flood generation in a large mountainous catchment (upper Rhône River, NW European Alps)" *by* Florian Raymond et al.

Anonymous Referee #1

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Review of "The role of precipitation for high-magnitude flood generation in a large mountainous catchment (upper Rhône River, NW European Alps)"

This paper describes the processes underlying floods that exceed the 3 year return period for the Rhône River over the period 1923-2010. This is done based on the following steps: i) identify floods events with a return period greater or equal to 3 years, ii) compare to which rainfall durations and timing best explain these floods, iii) provide flood topologies based on these comparisons and some cluster analyses. It is concluded that there are four flood types, which are described.

I have several major concerns that at present inhibit me from recommending publication

of this work in HESS:

*) It is unclear what we really learn. For example, the finding, which report correlations between floods and precipitation characteristics, these findings are only related based on the correlation of some floods of some catchment with some arbitrarily chosen P characteristics. This is potentially interesting, but does not answer any clear question to me, nor does it support the claim that "our results open new perspectives for flood hazard assessments directly based on climate model outputs.". Sure rainfall is important in driving this floods, but this seems trivial, and I would expect some clear insight beyond this trivial statement. The provided topology of floods is an interesting way to summarize the type of flood events, but I do not see how it is really relevant beyond the case provided here.

*) I am unconvinced the ERA data is accurate enough to do any kind of the inferences that are performed in this study. While it is argued that the data is accurate enough (to use percentiles), as supported by Fig A2, this figure to me shows a lot of scattering which lead to the conclusion that these data are in fact highly unreliable to use.

*) Why is soil moisture not considered in explaining the floods? Could this be ruled out a-priori for some reason?

*) The writing of the paper is often unclear or inaccurate. I made some suggestion below, but this list is far from exhaustive.

*) I found it hard to follow the figures, which I made some comments on below.

Detailed comments

L11: Drop "High-impact climate events such as" because you can simply state "Floods are highly destructive natural hazards causing widespread impacts on . . ." which makes it clear you focus on floods in this paper.

Line 12: "which limits reliable predictions", not "which limiting reliable prediction."

L13 "takes advantage of centennial-" or simply "uses".

L14: drop "the" before "high-magnitude".

L14: "the 99.9th percentile" not "percentile 99.9".

L17: "the amplitude of" seems redundant.

L29: "the frequency and magnitude" not "frequency and magnitude".

L34: drop the word "poor" otherwise the sentence is not logical. (Or change the word "limited" but that seems more complicated).

L36-37: Maybe it is my limitation, but I have no idea what a "socio-ecosystem" really refers too. Can you not just replace this by a less fancy sounding, but more straightforward word?

L40-41: "catchment characteristics, and air temperature, etc are not processes, as this sentence does imply.

L41-44: "Considered flood events . . . process-based flood types". This sentence needs to be rewritten

L45: rewrite to "lasting a maximum of one day".

L49: where does "2002" refer to?

L54: "per year" not "per years".

L39-63: This section seems to contain many irrelevant details on what is done (e.g. list of numbers of how many catchments are studied), rather than focus on "what is learned". This is not wrong, but in does not enhance the readability of the paper.

L69-70: what are "lesser informed events". Do you mean "event for which little hydrological data is available, and thus alternative sources of information need to be inquired"?

L70-71: how can both be "dominant" at the same time? Do you mean "important" instead? It is also unclear what "dominant" really means in this context.

L72-75: It is unclear what is being said here (and it seems to be a rather important statement).

L75-84: I do not see the relevance of this speculated reason. It is one of the many reasons that these floods have has less attention. I would just remove it.

L88: "to what extent" (not "in").

L88-90: this not only assumes that snow and ice are not important. It seems to assume that (antecedent) soil moisture is not important. . .

L97: "influence" is redundant.

L99: "Rainy days represent 30 to 45 %" is clear, but oddly phrased.

L99-100: What do you mean by "reaching 45 to 105 mm/day on average" what are these numbers based on?

L101:-102: are these mean monthly values? (I suspect that showing the seasonal hydrographs of the three catchments provides clearer and more concise insight into the differences in their discharge regimes.) This will also show if the discharge estimated in L130-135 looks reasonable.

L132: "it" not "its"

L137-142: It is unclear to me why this normalization has been performed. I.e. what do you really mean by "To reduce the influence of the marked glacio-nival or nival regime in the analysis of the discharges"? And why would you want to do that?

L148: "exceeding" not "upper than".

L173-181: You state that "[. . .], daily precipitation percentiles from the two datasets are in a good agreement (see Fig. A2 in the Appendix); when a high percentile value of

precipitation accumulation is observed for a given day in one of the datasets, a high percentile value is also observed for this day in the other dataset.". However, when I look at Figure A2 I find this difficult to conclude with so much scatter.

L186-189: I do not understand the description and meaning of Figs 2 and 3.

L198-199: "that best explain".