Hydrology and
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Discussions

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comment

Interactive comment on "How does initial soil moisture influence the hydrological response? A case study from southern France" *by* Magdalena Uber et al.

Anonymous Referee #3

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The manuscript "How does initial soil moisture influence the hydrological response? A case study from southern France" by Uber et al. sets out to explore the relevance of soil moisture for the generation of floods. Although the overall topic is highly appreciated, I am not sure what the novelty of this paper is, nor did the authors convince me about what they really want to do. There are several critical points I would the authors encourage to invest a bit more effort in to develop this study:

(1) It is not entirely clear what the objective of this study is. Is it intended to give an overview of the spatial pattern of soil moisture and how these evolve over time? In spite of a relatively rich data set, is such an analysis really warranted by the data? In

other words, are the conclusions drawn generally applicable or do they merely describe the relatively local study sites? If the latter, what can be learned from that? Or is the study rather meant to improve our understanding of soil moisture to generate flows? Then much of analysis and discussion of the spatial pattern can be condensed. What I also found surprising is that in the introduction much is made of the importance of flash floods, but this is not been really picked up and discussed explicitly later with respect to the results. Why?

(2) Soil moisture and its spatio-temporal pattern have been subject to a vast body of studies in the past. In that context, neither the introduction nor the discussion of the results here do any justice to these earlier efforts. How is this study placed in the context of this earlier work? What is different? What is novel? What is the same? Could your results and interpretation improve some of the earlier interpretations? If so, how? In which aspects are the conclusions you draw similar/not similar to other studies? Why? I would argue that there is quite a lot to discover on this topic and I would strongly encourage the authors to do so to allow the reader to better appreciate the authors' efforts. In addition to the other reviewers' suggestions, I would also think that (at least) the following references are highly relevant and provide necessary context and should thus be considered: McMillan et al. (2014), McMillan and Srinivasan (2015), Hrachowitz et al. (2011) and Li et al. (2011)

(3) More information and context is needed for the soil moisture data. It would be nice to have a more detailed map of the locations of the sensors (maybe also cross-sections), to get a better idea of what is observed where. Related to that, much is made of the, admittedly quite extensive soil moisture data set. However, in section 4.1 no consideration is given to the limitations of what is actually measured. In a simplified way, the role of unsaturated water storage lies in the temporal storage of water between permanent wilting point and field capacity (i.e. water held against gravity). At any point in time, this storage is controlled by plant water use (transpiration) and soil evaporation, whereby plant water use extracts water more efficiently than soil evaporation. Thus, to

make sure to meaningfully measure soil moisture, it therefore needs to be measured exactly where plant roots extract water from the soil. Is this the case here? it was mentioned that in the vineyards the sensors were place between the vines. Is this were the most important parts of the root system of vines is to be found? I could imagine that the measurements obtained are thus largely biased towards high soil moisture, as plant water extraction may be underrepresented in these locations. How would that change the interpretation? It would be good if the authors not only acknowledged this common problem but also discussed the limitations that come with it.

(4) Throughout the manuscript, methods could be explained in a clearer and more consistent way and some of the results could be provided in a more quantitative manner. Some examples: it is stated that regression methods require the assumption of "normal distribution of dependent and independent variables". What does that mean? Why should x and y have to be normally distributed? That would only lead to clustering. Do you rather mean that the residuals need to be normally distributed? Please clarify. Another example section 3.1.1. What do you intend to say with this paragraph? Why is it important to have normally distributed soil moisture? Similarly, in section 3.1.2 it is stated that "[...] pdf [...] agree with either normal distribution or [...]". Please use a more formal language here and provide quantification. Do you want to say that the hypothesis that the pdf is a sample from a normal distribution cannot be rejected on a 0.0x significance level? Then please say so.

References:

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