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Interactive comment on "On the value of high density rain gauge observations for small Alpine headwater catchments" *by* Anthony Michelon et al.

Anonymous Referee #1

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The paper aims at highlighting the values of high density rain gauges networks for hydrological purposes in small catchment of mountainous areas. The topic is interesting and relevant for the community. It furthermore has other potential applications in urban areas which are also small and quickly reactive catchments where rainfall variability has strong consequences.

Although quite short (and it should be stressed more clearly that it is a limitation of the study), the data set is relevant. The paper is well presented and easy to read (except for Fig. 8 and corresponding comment, see below).

However, I think that the indicators used to characterize the rainfall variability are too simplistic (basically an asymmetry indicator splitting the catchment in two) to enable robust conclusion. The indicators of hydrological behaviour also seem quite simplistic.

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And this is confirmed by the low scores and quality of regressions that are found. I believe that indicators enabling to grasp more precisely rainfall variability and its consequences should be used. I guess that this would enable to highlight more precisely the importance of dense networks of rainfall measurement devices.

Detailed comments:

- l.15 (abstract) : “the identification of key hydro-meteorological metrics that explain the runoff coefficient and lag times(e.g. total event rainfall, center of mass of the precipitation field)” : depending on the application there could be other indicators as well.

- Introduction : I believe it would be worth mentioning urban applications. Indeed, there have recently been numerous papers highlighting the need for high resolution rainfall data for these small catchments.

- l. 155-157 : I do not see where is the “steel sponge” on Fig. 3. Could you please highlight it ? It might be interesting to test the sensitivity of the results to this issue.

- Eq. 1 : it seems to be a very simplistic indicator of the rainfall variability. Many other have been developed to characterize much better the rainfall variability.

- Eq. 2 : given the fractal nature of river networks, how the river network was determined ? i.e. at which resolution was the upstream network not taken into account ?

- l. 230-231 : please clarify of the fast runoff is computed.

- l 237 : I guess it should be a reference to Table 2.

- Section 3.5 : I am not sure that AIC is needed, if the “corrected” version is also used.

- Section 4.4 : basically the absence of good models seems to suggest that the indicator used are too simplistic and do not enable to grasp the hydrological behaviour.

- Fig. 8 : I found it difficult to understand what is done. Could you please clarify ?

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