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Hydrology and Earth System Sciences
Discussions

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

Anonymous Referee #2

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I already reviewed the initial version of this paper, which aims at highlighting the values of high density rain gauges networks for hydrological purposes in a small catchment of mountainous areas. I still believe that 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.

The minor difficulties with regards to the presentation and understanding of the paper have been corrected. Results are now better presented with the new figures. However, the main point was not addressed, i.e. the fact that the authors aims at showing

the importance of grasping the spatio-temporal variability of the rainfall process in the prediction of flows, but the chosen indicators are only event based averages. Furthermore the main rainfall variability (which is at the core of the paper) indicator used is too simplistic since it is basically an asymmetry indicator on the total depth splitting the catchment in two. So I still think that indicators actually accounting for the spatio-temporal variability of the rainfall and hydrologic response should be implemented to actually address the stated topic of the paper. Implementing them requires major modifications of the paper. I guess that this would enable to highlight more precisely the importance of dense networks of rainfall measurement devices.

Specific comments:

- l. 110 – 115 : "The actual extent of the stream network is based on observations during dry and wet periods during Summer 2017 and its exact path was calculated using the Swiss digital elevation model at a resolution of 2 m (swissALTI3D, 2012)." I think that the intrinsic fractal nature of river networks should be mentioned and discussed. The concept of variable network used after also seems interesting.

- l. 150-151 : "Some additional artefacts were recorded, probably generated by strong winds creating resonance. These periods have been manually removed from the data". It should clarified how the data was selected for being removed and what portion was removed.

- 1. 154-157 : It is a great improvement to use this stochastic procedure. Nevertheless, I believe that more details on the interpolation procedure are needed. It should be clarified how the 20 samples are used (computing the error bars in 8-10)?

- Eq. 1 on I_ASYM. As already mentioned, it seems a too simplistic indicator to grasp spatio-temporal variability of the rainfall process. An initial simple suggestion could for instance be to look for the temporal evolution of I_ASYM during an event. But other indicators are needed.

- l. 212-215 : the explanation on why not using streamflow variations (notably peak flow) is not very convincing. If the purpose is to investigate the importance of spatio-temporal variability, I guess studying the temporal variability of the simulated streamflow is needed.

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