

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2022-26

Anonymous Referee #2

Referee comment on "Flood patterns in a catchment with mixed bedrock geology and a hilly landscape: identification of flashy runoff contributions during storm events" by Audrey Douinot et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-26-RC2>, 2022

General comments:

The occurrence of extreme events like flash floods are usually be linked to extraordinary catchment system states or precipitation characteristics. They may be a matter of threshold-behaviour. The analysis of the catchment runoff reaction on ordinary rainfall events with a linear model therefore does not necessarily contribute to the understanding of extreme events. Thus, I would strongly recommend to adapt the frame of your manuscript and agree with Prof. Dunkerley's comments.

It is clear that extreme events are very difficult to measure and often do not occur in the short measurement periods available in projects. However, the rainfall-runoff dataset generated from August 2019 to July 2020 is valuable for understanding the rainfall-runoff reaction of ordinary rainfall and maybe this should be the focus of the paper.

In order to be able to better classify the measured events, the following information would be very helpful:

- a) information about the flash flood events in 2016 and 2018
- b) information about the probability of occurrence of the precipitation intensities. I am not aware whether information on design precipitation with defined return periods is available in Luxembourg. Even if such evaluations are of course subject to uncertainties, they can nevertheless provide guideline values for the classification of the measured precipitation events.
- c) Presumably there is a difference in the runoff response between long-lasting precipitation events and very short ones with high intensity. In order to work out these differences, it could be valuable to classify the precipitation events.

Specific comments:

Can you please justify in section 3.1. why you used a unit hydrograph model and why you assume a constant runoff coefficient? Even if there is no ideal model, you could also use another methodology, so it would be interesting for readers to know why you chose this one, which has some weaknesses pointed out in the discussion (e.g. line 385, 392). In line 395 you state that for high intensity events, flood peaks are not well simulated. This again shows the problem that your analysis is not so well embedded in the topic of flash floods.

A sensitivity study with changed runoff coefficients, as mentioned by Prof. Dunkerley, would at least be very helpful.

Please comment on possible differences between the LAI survey period and the period of your data (e.g. land use changes). Please explain how you compressed the LAI data with a spatial resolution of 1 km² into a value for the correlation analysis. Did you use the mean value over the catchment area?

Please explain which soil moisture values you used in the correlation analysis? Did you use the value from the station situated in the respective catchment? If so, there are two stations in the HM catchment? Did you use the mean of both stations?

The lithological abbreviations (Km3, Li2, Li3) are confusing if one does not know the context (and therefore cannot assign the numberings – e.g. what is Li1?). In Fig. 1, some of the lithological units have an abbreviation, some do not. This looks very inconsistent. Would it be possible to do without the abbreviations (Km3, Li2, Li3)? If not, it would be important to at least cite the geological map from which these designations originate. In any case, I would delete the lithological abbreviations from the abstract.

240 ff.: Please mention that also the runoff coefficient is analysed.

384: What do you mean with: "the model overestimates the rising limb of the flood wave" – is it the duration of the rising limb, its slope or something else?

Fig. 10 and 11: please explain the size of the circles

504: Is „pseudo“ necessary?

Technical comments:

"et al" should be "et al." in the whole paper (see <https://www.hydrology-and-earth-system-sciences.net/submission.html#references>)

15/17: delete "Km3, Li2, Li3"

16: add "(HM)" after lower catchment.

62/576: „Bronstert“ (instead of „Bronstaert“)

106: add "(TTD)" after transfer time distribution

110: delete "(TTD)" after transfer time distribution

Fig 2 left and right are interchanged (Depending on whether the picture arrangement or the text is changed, the text in line 162 may have to be corrected.)

Fig 3 light brown is not clearly visible, please use a darker colour

246, 322, 336, 347, 353: correct "VOL1H" to "VOL1h"

270: "one event" instead of "one events"

Fig. 8: The labelling of the x-axes is wrong: it should be "median transfer time", "peak flow lag time", "runoff response concentration". You could also omit these words because they are explained in the figure caption and just write the abbreviations.

Fig. 9: I cannot find an x-axis for reading the LAI-values.

Fig. 10 upper line: SWC20 should be green, RC should be black

458: „McGlynn et al. 2004“ instead of „McGlynn, McDonnell, Seibert, and Kendall 2004“

478: “Scaini et al. 2018” instead of “Scaini, et al. 2018”

500: “Hortonian flow” instead of “hortonian flow”

You often use „note that“, I would avoid this phrase (at least I would not use it so frequently), but this is a matter of taste.