

Interactive comment on “Identifying runoff processes on the plot and catchment scale” by P. Schmocker-Fackel et al.

Anonymous Referee #3

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General comments

This paper makes an important contribution towards spatially explicitly identifying runoff generation processes in catchments at the plot scale and using this information to predict the catchment response to rainfall. The paper compares and discusses two approaches to determine runoff generation processes, a field and a GIS based approach. At the end, the information is used to predict runoff response in two watershed that show a remarkable different response despite its close proximity and similar land-use. The paper is well written, the methods and results well structures and developed and all tables and figures are necessary and of good quality. The paper is certainly worthwhile to be published in HESS.

Specific comments

1. Rivers do not only react differently to extreme precipitation (p2064), but to all kind of precipitation. Please make this statement more general.
2. I miss a good definition for dominant runoff process (DRP) (p2067, 2069). Is a DRP depended on the precipitation characteristic or is it a “fixed” property of a site (and at what scale) in a watershed? If several runoff processes can occur on one site during a storm event, the process that dominates is depending on the length or intensity of the vent.
3. Since the paper is not following a typical structure, it may be helpful for the reader if a short overview is presented at the end of the introduction of how the paper is organized.
4. In section 2.3, emphasize is given to the mapping of artificially drained areas. How important is it to know these areas? This could be a difficult task if the approach is applied to larger watershed or if only the GIS approach is used. Please comment.
5. The authors mention in 3.1 under Estimation of infiltration, that soil-surface sealing can reduce infiltration significantly. They should also add “water repellency” of the topsoil. A process that is important in alpine meadows and very important in forested watersheds affected by wildfire.
6. I am not aware of the term “fast drainable porosity” (p2070). I think the authors refer to “drainable porosity”, which is defined as the porosity between field capacity and saturation.
7. The authors claim in the section about Lateral flow (p 2071) that there is only lateral bypass flow in pipes and permeable layers that contribute to flood runoff. I would like to question this observation. Depending on the soil properties and the hillslope length, lateral matrix flow can also significantly contribute to storm runoff, in particular for events that last several days.
8. The authors state that SSF occurs on slope above 15

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9. The developed rule based approach uses land-use information, correct? However, it is not clear to me, how this information is included into the rules. It is not shown in Figure 5, but frequently mentioned on page 2073 and 2075. Please clarify.

10. Section 4.2 (and hence Fig 8) does not fit in this paper in my opinion. The information is not used for developing the rules, determining any plot scale processes or validating the mapping. It is a nice observation, but how can this be used to test your approach?

11. In the description of the process catena (p 2078), the authors observed return flow at P4. How can return flow happen at this site if there is no SSF above this area (SOF2 was determined). Isn't return flow only happening the capacity of SSF in a soil is exhausted and hence water starts to percolate back to the surface?

12. I think the paper needs to be precise describing precipitation. For example “Heavy precipitation” (L1, p2079) probably refers to a high precipitation amount. But “heavy” is usually more attributed to high intensity. Please clarify throughout the paper.

13. I do not understand how the discussion regarding actual contribution and connectivity of areas to the river networks (Section 4.4) does fit with the statement made in section 4.3 that considers the process catena as not being important. Should we now take some effort and developing tools to detect if an area is hydrologically connected to the stream or not?

14. Are the runoff volumes in section 5 for the events plotted in Figure 10 and 11 based on total runoff or only direct runoff (minus baseflow)? In case of direct runoff, please specify the method of defining baseflow.

15. I am wondering if the authors could comment how their approach could be transferred to a snow-melt dominated watershed.

Technical corrections

Pages 2072, Line 15 \dot{E} water levels fell slower than in the SOF2 well.

Pages 2078, Line 22 "because the low permeable moraine"

Page 2079, Line 17: Reference Lin et al, 2005 is missing in the reference list

Caption Figure 4: Surface runoff coefficients..

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