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Hydrology and Earth System Sciences Discussions

Interactive comment on "The influence of soil moisture on threshold runoff generation processes in an alpine headwater catchment" *by* D. Penna et al.

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We thank the anonymous referee for her/his comments, which helped to clarify some points and improve the revised version of the paper. The reviewer's comment is quoted above the authors' response.

"The paper presents the results of a two year field monitoring campaign, investigating runoff generation processes in an alpine headwater catchment. The paper is interesting and well written. Beside the points raised by the previous Referee, I have some doubts about what illustrated in section 4.4 and figure 6. If I understood, the maximum

potential riparian contribution (MPRC) is computed as follows: MPRC=(R/F)*(AR/AB) (1) where R is the total rainfall, F is total storm runoff, AR is the extent of the riparian area, AB is the extent of the entire basin. If equation (1) is correct, MPRC is the inverse of the runoff coefficient scaled by the ratio AR/AB. Thus, Fig. 6 describes the reduction of the inverse of the runoff coefficient versus the antecedent soil moisture: Fig. 6 represents the same data values of Fig. 3, although scaled in a different way. Provided that AR has been identified only by terrain analysis and no specific observations have been done to explore the degree of saturation of AR or the extent of the contributing area of the entire catchment, it is only possible to argue that small values of runoff coefïňĄcient are close to the ratio AR/AB and that it MIGHT be possible that the total storm runoff is originated by the riparian zone. If this is the case, I suggest to remove section 4.4 and to reduce the discussion about the role of the riparian zone to only those points which can be clearly supported with the field data."

The maximum potential percentage of riparian contribution to storm runoff (MPRC) was computed using the procedure proposed by Sidle et al. (2000). We used the following equation: MPRC= AR*P/F*100, where AR is the extent of the riparian area (m2), P is total rainfall (m) and F is stormflow (m3). This provides the maximum possible riparian contribution when the riparian soil is completely saturated and all rainfall on the riparian zone is converted into runoff. This equation is different than the one reported by the referee and, as such, it does not represent the inverse of runoff coefficient scaled by the ratio of the riparian zone area and total catchment area. Therefore, Fig. 3 and Fig. 6 in the original manuscript, although related, do not present the same data scaled in a different way. Moreover, the relationship between soil moisture and runoff coefficient in Fig. 3 is markedly non-linear whereas the relationship between soil moisture and MPRC in Fig. 6 is linear. We will provide a better description of the calculation of MPRC in the revised version of the manuscript to avoid confusion about the method. We agree with the referee that the lack of specific measurements (e.g., geo-chemical data) did not help us to absolutely prove the hypothesis that small values of runoff coefficients are related to the response of the riparian corridor only. We walked through the entire riparian area several times, during both low flow conditions and flood events and could visually assess the very wet status of the soil and the extent of the saturated riparian zone. This observation led us to assume a 100% runoff coefficient from the riparian area during rainstorms and supported the likely significant riparian contribution to catchment runoff during small rainfall events. The main point of this analysis, however, is that runoff during small events with dry antecedent conditions can volumetrically be explained by the contribution from the riparian zone but that there must be significant hillslope contributions during larger events or events with wet antecedent conditions. We will improve the text in the revised version of the manuscript to make this point clearer.

References

Sidle R.C., Tsuboyama Y., Noguchi S., Hosoda I., Fujieda M., Shimizu T., 2000. Stormflow generation in steep forested headwaters: a linked hydrogeomorphic paradigm. Hydrological Processes, 14, 369-385

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