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Hydrology and Earth System Sciences Discussions

Interactive comment on "Modelling runoff at the plot scale taking into account rainfall partitioning by vegetation: application to stemflow of banana (*Musa* spp.) plant" *by* J.-B. Charlier et al.

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Review HESSD 6:4307-4347

The authors have written a clear paper on modeling the effect of stemflow from banana on plot scale runoff, which, in my opinion, can be published in HESS with minor changes. The article is well structured and written. It is shown that models that do include stemflow perform better. It is made very plausible that, especially when rainfall intensities are relatively low (<Ks), stemflow contributes to runoff at plot level. The model is presented intelligently, including an interesting sensitivity plot showing the

co-linearity of Ks and stemflow partitioning.

Major remarks Surface runoff is, as the authors emphasize, a complex process. What remains a bit questionable in the presented model is the routing part. It is assumed that all "produced" surface runoff also reaches the bottom of the lot. Given the steep slope, this may be a bit OK but it remains somewhat doubtful that water running off at the base of a banana stem makes it all the way to the outlet. Such water is likely to run on to patches where the infiltration capacity has not yet been reached unless there is a well developed network of rills connecting the stems to the outlet. Does such a network exist? Have the authors any qualitative observations on flowpaths or was that difficult due to the presence of litter, etc.? So the main question is how redistribution within the plot is/should/could be accounted for? I appreciate that a model needs to have focus and few parameters to have analytical value so I would not recommend a much more complex routing scheme but the issue should be addressed.

Perhaps for this open discussion (not necessarily in the final paper), the authors may want to speculate on why banana has such a strong impluvial structure. Given the high demand bananas have for nutrients, perhaps concentrating water at the stem bottom increases weathering. In any case, it is difficult to imagine the advantages of such a structure unless there is also preferential infiltration along the root system. I hope the authors have sufficient direct observations to comment on whether preferential flow into the soil near the stem base occurs.

Minor remarks There are also other mechanisms that allow for runoff to occur while rainfall intensities are less than Ks measured at points during a dry period, such as air inclusion in larger pores and crust/mud formation during rainfall. These mechanisms are especially relevant under high intensity tropical rainstorms. The fact that in this case mainly during rainfall events of intermediate strength the runoff is higher than would be expected, points in the direction of stemflow. A brief discussion of the different mechanisms may be in place, however.

The routing model chosen is linear whereas it is likely that non-linear effects are relevant. Could you elaborate briefly on the reason behind choosing a linear model and on the possible (dis)advantages?

The optimization procedure follows a certain logic but it also seems somewhat arbitrary. Why was a manual two-step optimization used instead of, say, an exhaustive search over the low dimensional parameter space? Have other approaches been tried as well?

The standard deviation given for Ks is extremely low: 7.6 mm/h for an average Ks of 75 mm/h, especially because the range is more as one would expect (33-200 or so mm/h). Plse check.

The derivation of the model and its equations is sometimes a bit too pedestrian. A matter of taste but steps such as presented in eq. 11 can be omitted.

The text is well written but every now and then some typos seem to occur. The authors may want to go through the text carefully one more time. Examples: P4308 l 10: “related” instead of “relative” P4313 l 5: “partitioned” instead of “shared” P4324 l 23: “rainfall” or “runoff” would be better than “flood” (same in figures!)

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