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Hydrology and Earth System Sciences Discussions

Interactive comment on "Hydrological heterogeneity in Mediterranean reclaimed slopes: runoff and sediment yield at the patch and slope scales along a gradient of overland flow" *by* L. Merino-Martín et al.

Anonymous Referee #3

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The paper deals with hydrological heterogeneity, an interesting, timely and important topic, and certainly presents relevant scientific questions within the scope of HESS. Uniqueness in the paper lies in the tying the hydrological heterogeneity of runoff and sediment to heterogeneity of vegetation. The underlying assumption is that the different vegetation patches have a diverse hydrological role as either sinks or sources, and that the hydrological heterogeneity is modulated by the amount of overland flow at the slope scale. The authors conclude that the volume of overland flow routing along

the slope controls hydrological diversity. The references cover a broad range of the literature and well used. In the conclusion the authors identify that sinks are linked to certain vegetation and so are sources. The title is all encompassing and informative. The abstract is a concise and complete summary. The paper is well organized, well written, clear and easy to follow. Some lack of clarity in the paper arises on two fronts: (i) with respect to hydrological diversity, what is cause and what is effect? That is, is hydrological diversity a result of vegetation heterogeneity, or vice versa, or are the two so intertwined that it is impossible to separate because of the undoubted strong feedback loops between the two. Is vegetation heterogeneity due to in the first place? Soil factors, especially ones that influence soil water, which are known to be hugely spatially variable? (ii) I believe that the authors have poorly addressed the topic of infiltration. After all, runoff only occurs if infiltration capacity is exceeded. Not much information is presented on how the reclaimed slopes differ compared to close by natural slopes, and hence how 'unique' the reclaimed slopes are. It is not clear whether the authors intend for 'runoff sinks' and 'runoff splays' to be the same phenomenon.

The last sentence of the abstract is a powerful one. Is this a result that the authors expected, and do they recognize the feedback loop between hydrologic diversity and volume of runoff? Might the authors be better off using 'hydrologic heterogentity'as opposed to hydrologic diversity' as in the title? If not then diversity needs to be defined.

Early ecosystem development is a hot topic internationally now. The authors could make an even greater contribution to the literature if they could discuss how they envisioned their reclaimed slopes 'developing', that is developing hydrological heterogeneity. Did that start with how the material were placed done to begin with, and the inherent variability in soil parameters that lead to varying infiltration that leads to varying germination that le3ads to varying vegetation establishment that leads to varying runoff volumes?

Specific comments: (a) Page 9935, line 23: how is event defined? It would be good to note that the precipitation was 18.1% above normal (next line). (b) Page 9936,

lines 7-11; this could be counterintuitive: higher runoff should mean lower soil moisture (less infiltration, which occurred first), and higher soil moisture through its influence eon infiltration is often related to higher runoff. How do the authors rationalize this discrepancy? (c) Page 9937, line 11: capitalize Gerlach. Line 19: is preferential sheet-flow not an oxymoron? (d) Page 9939, top 3 lines: why should it be delved into? Lines 22-23. Statements here justify my comment (ii) above. 'Good at obstructing runoff and sediments' means that the water has failed to infiltrate and is flowing; the meaning and explanation for the phenomenon in the next part 'it is not so efficient infiltrating water in depth' is unclear. Why not? Infiltration first, then runoff, or not. (e) Page 9940, line 5: I think the authors should say: Higher soil moisture after rainfall is a good indicator of a runoff sink role. Then lien 7: what is the physical explanation for why this vegetation would incorporate water at depth? Physically that is not possible: vegetation can enhance soil properties that in turn enhance infiltration that in turn increases soil moister, so the effect is extremely indirect. Line 8; lower than what? Lines 17-18: dependent variable always mentioned first: vegetation patches depend on micro-topographic structures not the other way round. (f) Page 9941, lines 17-19: powerful statement and very important, but what proof do the authors present for this? Lines 20-26: does alliopathy paly any role in heterogeneous vegetation patches? (g) Page 9942, line 10: significantly. Line 18; causes; line 19: referred to as (h) Page 9943, first 2 lines: how could higher soil moisture not be a pulse for vegetation growth? Line 14: what proof do the authors have that this unequivocal statement is true. And what exactly is 'hydrologic diversity' and how is it related to heterogeneity, the sword used in the title? (i) Table 1: 10 cm depth of sampling seems to be rather shallow. Soil profile characteristics in at least the top 60 cm likely influences infiltration and vegetation growth. Two decimal places for most parameters are unwarranted, e.g., % S, Si and C. Corerct SI untis for bulk density are Mg m-3. A value of 0.05 for field studies seems rather stringent. (j) Table 2: Correct SI units for bulk density are Mg m-3. The authors are using AWC incorrectly. The difference between field capacity and wilting point is available water holding capacity (AWHC) or in some journals simply water holding capacity (WHC). (k)

Table 3: great data. 30 minutes is a fairly long time. The data might be more instructive if they were arranged in descending order of storm depth. It is not clear form the table that Depth is indeed storm depth. (l) Figure 3; the one line is so different fo0mr the others; do the authors speculate why? Better to use L for litres to avoid confusion (in b). And always a space between a number and its units. (m) Figure 6; vegetation types are explained but they are not referred to in the figure.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 9927, 2011.