

Interactive comment on “Connecting ecohydrology and hydro pedology in desert shrubs: stemflow as a source of preferential flow in soils” by X.-Y. Li et al.

Anonymous Referee #2

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In the current from the paper should be rejected for two major reasons: 1. The conclusions are far too strong and broad for the research presented. Despite the large number of figures, there is in fact not very much data on preferential flow in the paper, neither is there the “clear evidence” of deeper penetration of water in the soil. There is significant data on stem flow and this might be an interesting contribution. 2. The research is not sufficiently set in the existing research in preferential flow in sandy soils and particularly neglects major research in finger flow (the work by G. de Rooij).

These are the two most fundamental issues, but there a range of other problems with the paper which lead me to my rejection decision.

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Figure 11 and 12: These figures do not include standard errors even though more than one measurement was taken, which means we cannot draw any conclusion about separation of the treatment effects

Figure 6 and 7: The interpretation of the arbitrarily fitted and very weakly correlated function to the data is based on one other paper. There is no real theory to support the suggested function other than: “the [canopy] area contributing to stemflow increases until a threshold” But that would not explain the decrease in F or the curved line in Figure 7, rather it would suggest a sigmoidal or plateau function. I am not a tree physiologist, but I would think that Figure 6 and 7 indicate that complex leaf behaviour under rainfall is properly not captured with a simple funnelling ratio. Given that leaves are not fixed plateaus but can move with wind and under heavy drop impact, I believe that there is probably more than simple stemflow.

Cause and effect: The authors seem to suggest several times that plants actively cause stemflow to occur to create a subsoil that is more wet (Conclusions p 1564; Introduction p 1555). I have real trouble believing this. There is nothing in the presented research that suggests an active ecological process and in fact there is no discussion on the question whether this is an active or passive process.

Moreover a simpler question about cause and effect is also not answered. Is the preferential flow occurring due to the plant being there and causing stemflow or is this due to higher carbon content close to the plant or the lower bulk density due to root growth that the water infiltrates further.

Given my experience with dye experiments and preferential flow I am very worried about the conclusions based on the dye infiltration experiments. Essentially there was only one replication of each treatment. Dye infiltration patterns are notoriously variable and difficult to interpret and therefore 1 replication can never be sufficient. The review paper by Flury et al. (1994) is still a classic and should be read by anyone working with dyes to study preferential flow. There is no guarantee the authors were “just lucky” with

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their dye experiments.

Given the fact that the soil moisture results suggest very little difference and that no errors are presented in Figure 11, I don't think we can conclude that water infiltrated deeper under the plants.

Do plants outside desert areas also concentrate stemflow, if so, does this not invalidate your conclusions?

Overall I am happy to accept from the results that plants funnel rainwater due to their structure and that some plant structures are more effective than others. I am also happy to conclude that due to the roots, associated hyphae and or biological activity infiltration under plants in desert areas is much higher than outside, this links strongly into the ecological literature in banded vegetation (i.e. Ludwig et al. 2005). However, that this is an active process is hard to believe.

Flury M, Fluhler H, Jury WA, Leuenberger J (1994) Susceptibility of soils to preferential flow of water: a field study. *Water Resources Research* 30, 1945-1954. Ludwig JA, Wilcox BP, Breshears DD, Tongway DJ, Imeson AC (2005) Vegetation patches and runoff-erosion as interacting ecohydrological processes in semiarid landscapes. *Ecology* 86, 288-297.

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