

GENERAL COMMENTS

Li et al. present the results of an interesting field experiment focussed on partitioning of rainfall in stem flow, through flow and preferential flow toward the deep soil layers, in an arid site. They evaluate and confront the above mentioned major components of the water balance for different daily rainfall amount and rainfall intensity, for two shrub species. They combine different experimental methods, namely: direct volume measurements, dye tracer and soil moisture measurements; and draw major conclusion on the impact of stem flow on surface water redistribution and on the link between stem flow and preferential flow induced by the presence of roots, that leads to water accumulation within the deep soil layers.

The experimental results represent a valuable dataset, it is presented in a clear way in the manuscript by an appropriate number of plots. The data evidence important interrelation between hydrologic fluxes and vegetation structure and functioning and could inspire significant improvement of commonly adopted models for eco-hydrology in arid land.

The major results concern the evaluation of stem flow that (as expected) increases with daily amount of precipitation, and (more interestingly) seems to decrease with rainfall intensity.

Secondly, the dye tracer experiment evidence that preferential flow due to the presence of roots develops mainly at certain rainfall intensity.

Particularly interesting appears to me the interrelation between stem flow and preferential flow due to roots, but unfortunately the functionality of such interrelation as the rainfall intensity varies is not clearly demonstrated in the manuscript. Whether there exists any synergy between stem flow and preferential flow at certain rainfall intensity appears to me unclear, although this interesting point could deserve, in my opinion, a more thoughtful discussion on the base of the experimental results.

Relevant conclusions are based on the tenet that all stem flow becomes preferential flow through roots. Unless the author clearly define stem flow, preferential flow and then postulate that all stem flow become preferential flow below ground (as a non expert of this field, this is not obvious to me), the asserts contained in the last Section are not supported despite their appeal.

In conclusion, the text, in my opinion could be improved by adding precise definitions of fundamental variables (such as stem flow) and skipping or smoothing few non supported statements (see also the specific comments).

Finally, I appreciated very much the analysis presented by Li et al., even though it could certainly benefit of a comparison between measurements and prevision of (even just conceptual) models, although this could be beyond the scope of the manuscript.

SPECIFIC COMMENTS

Page 1552 lines 15 to 17: How can the authors be sure that the flow channelized by roots is all stem flow? Could it be just preferential flow from soil surface different from the base of the trunk?

Page 1553 lines 9 to 17: I would suggest to add a precise definition of stem flow at the beginning of the Introduction. Here stem flow seems to be flow through stems and along roots (below ground)

whereas, on the base of the experimental setup and previous definitions it should be that stem flow is the flow of water down the trunk or stem of the plants. Also, Page 1555 lines 6 to 10, support this assert. Thus, the manuscript seems to contain contradictory tenets.

Page 1554 line 29 to Page 1555 line 5: I would expect that soil characteristics, depth of the bedrock and frequency of rainfall events have an impact on the storage capacity of the deep soil layers. After rain soil moisture redistributes, possibly toward deeper soil layers and thus, water that has been channelized at the base of the root apparatus may not be there when the plant needs it. The authors should comment on that.

Page 1558 lines 15 to 17: The description of the experimental setup is not clear to me. What does the sentence: “ The other one was treated as no stem flow” mean?

Page 1561 lines 11 to 15: What do the authors mean with “major rainfall”? ...(I imagine that 4.9, 9.1, and 32 mm are amount of daily rainfall, and thus that the three event correspond to case studies with decreasing rainfall intensity...the authors should clarify this point.).

If stem flow decreases with rainfall intensity whereas preferential flow is more pronounced for higher rainfall intensity (and, in such a case, I misunderstood Figures 8 and 9, since cumulate rainfall amount should be negatively correlated with rainfall intensity), the two processes compensate; otherwise, if both of them increase with rainfall intensity, then, stem flow enhances the impact of preferential flow. This interesting point should be clarified.

Furthermore, I think that one may attempt a more physically based explanation for the phenomenological evidence that preferential flow occurs due to the presence of roots at low rainfall intensity, just to clarify from a physical point of view the soil behaviour.

Page 1562 lines 21 to 23: None of these asserts is supported . See previous comment.

Page 1563 lines 5 to 6: How could the authors attribute the increase of soil moisture to stem flow, when they just evidenced an increase of preferential flow with rainfall amount, leading to higher soil moisture in the deep soil layers with any considered amount of rainfall.

Conclusion: conclusion are just conjecture, unless the authors postulate that all stem flow becomes preferential flow through roots.

TECHNICAL CORRECTION

Page 1552 lines 12 and 13: replace “tree” with “shrub”.