

## ***Interactive comment on “Temporal-dependent effects of rainfall characteristics on inter-/intra-event stemflow variability in two xerophytic shrubs” by Chuan Yuan et al.***

### **Anonymous Referee #1**

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The paper by Yuan et al mainly aimed to characterize the inter-/intra-event stemflow dynamics of two xerophytic shrubs and to quantify their relationships with the corresponding inter-/intra-event rainfall characteristics. They concluded that rainfall characteristics had temporal-dependent influences on corresponding stemflow variables. From my point of view, the study has potential to make a contribution to a better understanding of, in particular, the intra-storm stemflow processes and the underlying mechanisms governing its dynamics. The experimental design and data analysis are generally acceptable, while clarity is needed in presenting the design. The figures adequately summarize the results. I recommend this paper for publication in HESS after some moderate revisions had been addressed by the authors.

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#### Moderate/minor comments

1. L 69: Change “initialed” to “initiated”.
2. L 72: I would use “leafed period” instead of “leaf period”.
3. Section 2.2: What is the time interval for recording rainfall and the stemflow in subsequent section? This needs to be clearly stated.
4. L 184-186: According to Table 1, stemflow data of *S. psammophila* are not available for branches with a BD of 15-18 mm rather than 18-25 mm. Please verify this.
5. Section 2.4: I miss the information about how many rain gauges the authors used in recording stemflow. Did each branch connect to a rain gauge? It seems to be the case from my view of Fig. 1, which makes a total of 14 rain gauges. Please explicitly state to avoid guessing.
6. L 203: I would change “base area” to “orifice area”, which is a more accurate terminology for rain gauge.
7. L 200-210: As for mL of SFV, it should be calculated as:  $SFV = [\text{mm (branch stemflow recorded by tipping-bucket rain gauges)} / 10] \times \text{cm}^2$  (orifice area of a rain gauge). I think the authors missed a 10. Therefore, for the calculation of stemflow volume and stemflow intensity, I suggest that authors provide the corresponding mathematical equations; it would be concise and easier for readers to follow.
8. L 211-215: According to the calculation of TLG, TLM, and TLE, these variables can have either negative or positive values. I encourage the authors to clarify here their respective meanings, i.e., what positive values are suggesting and what negative values are suggesting. Again, it would be easier for readers to better understand their following results.
9. L 258-259: It would be more straightforward to add a row in Table 2 showing how many rainfall events occurred for each category (Event A to C, and others).

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10. L 291-298: If it is possible, I would also expect to see some results about the differences of stemflow variables varied among BD categories.

11. Section 4.1: I would like to discuss with the authors about the use and importance of stemflow intensity and RSFI. I admit that stemflow intensity would be a good variable to show the dynamics of intra-event stemflow, while I am not convinced by authors about the importance of comparing the absolute values of stemflow intensity versus rainfall intensity (also demonstrated in L26-30 of Abstract). Their study is based on monitoring branch stemflow, and branch stemflow intensity was a bit higher than rainfall intensity in their study. However, in terms of stemflow's ecological and hydrological importance such as in providing additional soil water and sustaining vegetation growth, we pay more attention to the whole tree/shrub (rather than a single branch). From my understanding this variable is highly dependent on the size of a shrub/tree, because a larger shrub/tree (normally has larger basal diameter or canopy area) would generate substantially higher volume of stemflow, therefore stemflow intensity calculated based on collecting from individual trees/shrubs would be far greater than rainfall intensity, as examples please see Fig. 3 in cayuela et al. (2018, Journal of Hydrology) or Fig. 7 in Germer et al. (2010, Journal of Hydrology). Stemflow and rainfall differs in their paths entering into rain gauges; the orifice area makes sense for rainfall because this area is precisely where rainfall falling into and rainfall depth is then normalized, while stemflow is part of intercepted rainfall by the canopy and then comes down stems, which indicates that infiltrating soil area of stemflow is quite different than that of a rain gauge (i.e., orifice area). Therefore this variable may be prone to underestimate stemflow's eco-hydrological role for small shrubs, as such, in terms of ecological importance this variable seems to be less appropriate to be used for inter-specific comparison or even intra-specific comparison of varying sizes. Moreover, the authors were also recommending a future combination use of funnelling ratio and RSFI in stemflow studies. While I agree with the authors that RSFI is helpful in better understanding of the intra-event convergence effects, funnelling ratio assumes trunk/stem basal area is the true area that stemflow is delivered to the soil, whereas RSFI here is based on stemflow

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intensity which I have discussed above. RSFI may also be prone to underestimate stemflow's eco-hydrological role for small trees/shrubs while overestimate that of big trees/shrubs. I encourage authors to discuss both the advantages and limitations of stemflow intensity and RSFI as well as their application.

12. L 433-437: These sentences are somewhat redundant (have been mentioned in above sections) and can be simplified or simply deleted.

13. Figure 3: Data points are average values for 7 branches for each event? Since the authors selected 7 branches of varying BD for each species to measure stemflow, a relative larger difference in stemflow would be expected among branches. It would be an option to adding error bars if they won't make the figure blurring too much.

14. Figure 4: The unit of rainfall stemflow intensity should be mm h<sup>-1</sup> rather than m h<sup>-1</sup>. Also changes should be made in the legend, since both lines and points are included in this figure, it would be misleading by labelling "Lines in blue" or "Lines in red" without mentioning points. Moreover, since 7 branches for each species were selected for monitoring stemflow intra-event dynamics, I am wondering which branches for two species were demonstrated in this figure.

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