

# Review via EGUsphere for HESS

Evaluating Different Roughness Approaches and Infiltration Parameters for Vegetation-Influenced Overland Flow in Hydrological Model

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## General

This manuscript provides valuable insight into the importance and sensitivity of roughness parameterization and infiltration values commonly applied in hydrological modelling and engineering decision-making. The authors employ appropriate methods to address their research objectives; however, there is room for improvement in the justification and explanation of certain methodological choices, as well as in the presentation of the results. The use of previously published data to implement the modelling framework is appropriate and well justified. I strongly recommend expanding the description of the modelling approach and the application of the referenced data in Section 2, as detailed in the specific comments. In addition, strengthening the introduction and better aligning the overall storyline with the discussion would further enhance the scientific contribution and overall impact of the study.

## Specific comments

1. Lines 21-32, it makes your case stronger if you link your statements to more or general (important) references (as applied after line 32).
  - A. I.e. In line 25, you cite Zhang et al. 2018, I assume there are much more (important, or general) references underlining this statement. Please check/read and especially references therein or there to:
    - Busari et al. 2016 <https://doi.org/10.1016/j.jher.2016.02.003>
    - Crompton et al. 2020 <https://doi.org/10.1029/2020WR027194>
    - Jackson and Klaus 2025 <https://doi.org/10.1029/2025WR040753>
    - Bachmair et al. 2012 <https://doi.org/10.1029/2011WR011196>
    - Crompton et al. 2025 <https://doi.org/10.1029/2024WR037176>
  - B. I.e. 2, Line 26. There are much more (important, or general) references underlining this statement, please check/read and especially references **therein** or there to (as you already do in the discussion!):
    - Beven and Germann, 1982 <https://doi.org/10.1029/WR018i005p01311>
    - Cerda, 1996. [https://doi.org/10.1016/0016-7061\(95\)00062-3](https://doi.org/10.1016/0016-7061(95)00062-3)
    - Liu et al. 2025 <https://doi.org/10.1016/j.jhydrol.2024.132465>
    - Thompson et al. 2010 <https://doi.org/10.1029/2009JG001134>
    - Zwartendijk et al. 2017 <https://doi.org/10.1016/j.agee.2017.01.002>
2. Line 45 "... staple area of research within hydrology", explain and/or add reference. This needs to be phrased stronger.
3. Lines 53-56. The coherence between the sentences is not clear. What is examined in this study and what is the additional value after the previous mentioned studies? Which findings highlight the need for further evaluation?
4. Lines 57-59. You're totally right. You may consider re-structuring your introduction in line with previous comments on references.

- A. Try to synchronize your introduction and discussion such that your discussion finishes the line from introduction, to methods, and your results to the discussion.
  - B. Try to embed the references from the discussion into the introduction.
5. Lines 57-59. A pity that, again, limited references are shown. I think it is important to show that some cases/models are available incorporating infiltration and roughness (varying per land cover/vegetation type), although examples are limited. i.e.:
  - A. VanderKwaak and Loague, 2001. <https://doi.org/10.1029/2000WR900272>
  - B. And their more recent studies, i.e. cited in Zwartendijk et al. 2026 <https://doi.org/10.1016/j.jhydrol.2026.135259>
  - C. Schwemmler et al. <https://doi.org/10.5194/gmd-17-5249-2024>
6. Your objectives suggest modelling, but you start section 2 (Materials and methods) with the study site and experimental set-up which is not part of your study. I strongly recommend that you start explaining your approach (to model) but the use of previously gathered data conform your objectives (perhaps mention this approach already in your introduction?).
7. Line 111, "The elevation model is generated". How? Lidar? Measured by...? Third-party data? Accuracy?
8. Line 113, what is the definition of a homogeneous surface?
9. Line 113-115, perhaps cite other research applying the same simplification? Or explain why.
10. Lines 116-120. You mention that Ries et al. (2020) measured flow at three locations within the trench, but I found this part difficult to follow. The explanation does not clearly correspond to the photograph shown in Figure 1b, making it hard to place these measurement points spatially. I recommend indicating the measurement locations explicitly in Figures 1a and 1b (e.g., using markers or annotations) to improve clarity. The same applies to the description of the trench geometry and the "one-third" section, which is not clearly identifiable from Figure 1b alone.
11. Lines 127-135. "are not typically measured in the field". Why not? If in general, add references. If our co-scientists of Ries et al. 2020 did not measure it (i.e. because it was not their scope), just mention that it's not measured or available.
12. Line 133 "calibrated to best match observed runoff data", is this explained elsewhere? Perhaps insert link to sub-section.
13. Line 133, "It should be considered that, ...", do you mean "It should be kept in mind that,..."?
14. Lines 143-157, a part is repetitive (introduction?). Please elaborate on the two depth and five depth-independent roughness functions, it is not clear why you introduce 2 methods but show 7 options in the following paragraphs. Make sure you introduce 2.2.1 – 2.2.7. In its current form it is not clear why you introduce these different concepts. Which did you apply?
15. Lines 208-209, as a reader I had to check which 6 runs you're aiming for. Please consider restructuring the methodology. Also, which of the runs did you select and why? I don't think line 218-221 is the right location to mention this.
16. You created a very nice flow chart (of your methodology?), figure 2. Consider some minor editions conform previous comments and show this early in the methodology! I think it improves the readability of the methods section majorly! 😊
17. Table 3. You may increase the readability to use ranges and just the > and < symbols, not mentioning NSE and pBias in the table as that is given in the header already. So: >0.75 for good, 0.36 – 0.75 for qualified, and <0.36 for not-qualified.
18. Line 240-241 consider a reference or longer explanation.
19. The figure is difficult to interpret in its current form. In the text, negative NSE values are discussed, but these are not visible in the figure. In addition, the red bars are described as

indicating model failure, yet they appear to correspond to  $NSE = 1$ , which seems inconsistent with the definition and discussion of NSE. I recommend reconsidering the figure type or its visual encoding to clearly distinguish positive, zero, and negative NSE values and to ensure consistency between the figure and the accompanying text.

20. Table 4 and related text, perhaps I missed it, but how realistic are the calibrated parameters? Does it match with field or literature values?
21. Lines 284-286, did you use a statistical comparison method like Anova or? If yes, not mentioned in the methods?
22. Lines 290-294, you may consider to move these lines to the Discussion section. You may consider to add references to support your claims.
23. Effect of initial condition and pre-event soil moisture. Can this be explained as temporarily hydrophobicity of the soil for example? I think it's recommended to elaborate on this in the discussion as initial condition of soil moisture has a large impact on your (and other research's) outcomes.
24. Lines 329-330, Please elaborate on this as its purpose and contribution to this paragraph is not clear to me as its not described in the methodology section. Are you comparing the individual sites or the separate model outcomes? I suggest to extend the methodology so its clear to the reader what kind of comparisons you made (and using with methods are used for these comparisons).
25. Figure 8. Are you presenting calibrated or measured  $K_{sat}$  values? Did you determine the vegetation cover yourself or are the values determined by Ries et al. (2020)?
26. Lines 385-387 add reference, idem for 387-389.
27. Lines 419-423, add references.
28. Lines 453-459. Please consider incorporating references from studies conducted in different climatic and geological settings to place the results in a broader context. Furthermore, I suggest replacing the phrase "validate previous research" with "are in line with studies elsewhere", which is more appropriate and nuanced given the scope of the analysis.
29. Lines, 471-473, in line with remark/comment #20, please elaborate on the estimation/range on the calibrated parameters ( $K_{sat}$ )? Does it match with field or literature values? Which model result not only in the most realistic outcome, but also in the most realistic values for  $\psi$  and  $K_{sat}$  values? Consider keeping this paragraph descriptive and analytical, with final conclusions presented in the Conclusion.

## Technical corrections and possible editions

30. Line 15 (and elsewhere), you may consider changing  $K_{sat}$  into  $K_{sat}$
31. Line 44, add additional reference.
32. Line 75, end with a .
33. Line 231, MSE should be NSE?
34. Figure 3, in the current pdf version the figure is (too) small, make sure in the final version that it is readable!
35. Figure 5. To increase the readability, you may consider to use the same lay-out as figure 4 (after editions).
36. Line 370, multiple spaces between "lower" and "NSE values".
37. Line 475, I suggest to rephrase this to: "Our study evaluates seven roughness estimation methods and their impact to overland flow modelling using OpenLISEM".
38. Line 476, I suggest to replace this sentence by one summarizing your applied methodology.
39. Line 491, be specific, what is "this" model, the OpenLISEM?