

RC2: '[Comment on egusphere-2025-4424](https://doi.org/10.5194/egusphere-2025-4424)', Anonymous Referee #2,
11 Dec 2025

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Response: We thank the reviewer for taking the time to read and comment on our manuscript. We will provide our responses in blue directly in the text below.

This manuscript provides a useful overview of difficult problems facing the investigation and understanding of subsurface stormflow at multiple scales and providing pathways forward. I enjoyed reading it, and I have only minor comments and suggestions.

Response: Thank you very much for these encouraging remarks!

First, in the abstract, "the impact of SSF on streamflow dynamics and water quality is much larger than commonly assumed" is too strong a statement. I suggest changing "is" to "can be" because the importance is highly variable across and within hillslopes.

Response: We will rephrase this statement

In the paragraph starting at line 53, I would insert a sentence or two discussing the fact that SSF merges and mixes with riparian and hillslope groundwater at the toe slope and floodplain margin, mixing the tracer signals observed in streams.

Response: We very much agree that this is an important issue (we have two projects focusing on exactly these aspects) and will highlight this more in the revised manuscript.

In Challenge 2, I would cite Wood and Rowe 1996, Freer et al. 2002, and Du et al. 2016 to demonstrate that SSF has been found to be highly variable even within single hillslopes by every study designed to examine such variability.

Response: We will highlight this point more strongly in the revised manuscript.

I suggest adding a Challenge 4 on the difficulty of observing and modeling the effects of the distribution of conductivity values affecting flow and solute transport at multiple scales. The hillslope community tends to conceptualize SSF as binary between matrix and preferential flow, but in reality there is a continuum of hydraulic conductivities at work across all spatial scales. The bulk conductivity of REVs may work for flow predictions, but does not account for observations of solute movements.

Response: This is a very good point and should indeed be mentioned. We will add this in the revised manuscript.