Comments on the Manuscript “Trifluoroacetate mobilization by subsurface stormflow: the role of soil layer connectivity and prior flushing history”

by Immanuel Frenzel and co-workers

Summary: This is a well written and technically sound experimental study investigating event scale leaching of Trifluoroacetate (TFA) with subsurface storm flow. The authors explore in total four events with contrasting antecedent conditions, determining the concentration of TFA, major cations, sulfate, nitrate and chloride in rainfall, throughfall, surface runoff, stream flow, shallow and deep subsurface storm flow as well as shallow and deep groundwater. This revealed an enrichment of TFA in deep subsurface storm flow and shallow groundwater water. The authors determine additionally TFA concentrations in tree leaves, needles, fresh fallen litter, old litter, organic topsoil and subsoil. This revealed peak concentrations in fresh fallen litter and tree leaves. The observations for unflushed conditions in August 25 and Jan 26 revealed that TFA concentration increased strongly during rainfall driven onset of bottom subsurface storm flow, clearly speaking for a transport limitation. The authors explain this behavior by mobilization of TFA from the organic pools, in combination with rapid vertical bypass flow and onsetting hydrological connectivity triggering SSF. On the contrary the concentration of most other ions was diluted, speaking for reaction limitation.

Evaluation: The proposed study is well written, based on high-quality field experiments and provides novel insights into the event scale leaching behavior of TFA. Yet I made a few observations that might help to further optimize the study in a round of minor revisions.

- Could you maybe calculate the TFA loads? This will reveal that unflushed events A and C mobilize way more mass than the other two events.
- How deep is shallow and deep groundwater?
- I assume TFA is adsorptive, does this explain the delay compared to K+ (which is also adsorptive) in Figure 4C?
- Maybe show error bars in Figure 3?
- The color code in Figure 1 should be improved.
- Figure 1 B, the blue soil moisture time series (depth 1.m) looks like a wave and is very distinct from the other events. Does this indicate lateral flow?

Best regards,

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