

Interactive comment on “A porewater – based stable isotope approach for the investigation of subsurface hydrological processes” by J. Garvelmann et al.

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Authors comment #1

First of all we would like to thank the referee Mike Stewart for his thoughtful and encouraging review that will definitely help to improve the manuscript. Please find below the answers of the authors (AC) to the comments of the referee (RC)

RC: There is an elephant in the room here, because the study is focused on the soil but the parts below the soil are at least as important in understanding the catchment hydrology. The study shows flow is vertically downward in the upper parts of the catchment,
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and some flow will undoubtedly be upwards near the stream. Hence there appears to be an important groundwater component contributing to the lower hillslope and thence to the stream, but no way of characterizing it. The authors note that it would be interesting to compare deuterium profiles with groundwater level data at the base of the hillslope in future studies. The role of occasional groundwater level rises in causing the smoothed portions of the deuterium profiles is also mentioned. Including some deeper deuterium profiles in upper parts of the catchment would also be interesting.

AC: Indeed, the groundwater component is very important in most catchments, certainly also in this catchment. We can clearly show this with the observed profiles at the foot of the hillslope and the comparison to the observed deuterium values of the groundwater. In the revised manuscript we will make this link clearer. In a potential future study more focus could be on the role of the groundwater component as already mentioned in the manuscript. Especially at the foot of the study hillslope a groundwater level monitoring would provide interesting data. Deeper deuterium profiles in the upper parts of the hillslope would also be very interesting, however, with the drill core we used in the field campaign it is not possible to get deeper into the bedrock at the upper parts of the hillslope as the depth of the soil profiles at transect T2 shown in this study. Another idea to learn more about the vertical flow in the upper parts of the hillslope would be to drill several soil profiles throughout the year. We are currently performing a similar study to study the changes of the deuterium profiles throughout the year.

Technical Corrections

RC: P9092 L1 Wrong word – suggest use “concluded” or “surmised” instead of “summarized”. AC: Thank you! “Concluded” is better and will be used.

RC: P9092 L18 “rapidly” not “fast”. AC: “Rapidly” will be used.

RC: P9097 L28 “soil depth” not “soildepth” AC: will be changed

RC: P9098 L4 “a high” not “an high” AC: Correction will be applied.

RC: P9098 L7 “hillslope” not “hillslope” AC: Indeed, hillslope is correct.

RC: P9098 L13 “Stewart” not “Steward” AC: We are sorry for the wrong citation!

RC: P9098 L25 et seq. Suggest “This behavior was not observed” not “This behavior could not be observed” AC: Will be corrected in the revised version.

RC: P9099 L12 I think “a stable stable isotope signature” is meant not “a stable isotope signature”, but this is clumsy. Suggest “a stable deuterium signature” AC: The referee suggestion will be used.

RC: P9099 L14 Suggest a new paragraph starting from “Figure 8” AC: A new paragraph makes sense and will be implemented.

RC: P9100 L16 “provided a good indicator” not “provided a good influence” AC: The suggestion of the referee will be considered in a revised manuscript.

RC: P9100 L17 Change “lateral subsurface” to “lateral and upward subsurface”? AC: Since we do not know if the subsurface flow is just lateral or lateral and upward, we will still use the formulation in the submitted manuscript.

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