

Interactive comment on “Hydrogeology of an alpine rockfall aquifer system and its role in flood attenuation and maintaining baseflow” by U. Lauber et al.

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Reply to comments of an anonymous reviewer on the manuscript “Hydrogeology of an alpine rockfall aquifer system and its role in flood attenuation and maintaining baseflow” by U. Lauber et al.

Summary: The paper has a good quality and is within the scope of HESS. The text has a clear structure, the focus is well expressed and the results are well documented by tables with data and informative figures. From my point of view the list of references comprises all important publications. The paper should be accepted for publishing in

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the HESS Journal with some minor revisions.

Reply: We thank the anonymous reviewer for approving the good quality of our paper and acknowledging the clear structure and focus of our manuscript. Here are our answers for her/his constructive comments that will contribute to further improve its quality.

Comments:

page 6809, line 10 to 15: The description of the research area is a mix of the situation in the entire Wetterstein area and of the Reintal itself. The Reintal has only one cirque (if the so called Zugspitzplatt can be termed as a cirque at all...) with two vestigial glaciers of a total extent of about 32.6 ha in 2009. This should be expressed more exactly.

Reply: Revisions will be made.

page 6812, line 4: The term “swallow hole” is related to karst geomorphology. It should be used a more unspecific term as “sink” for instance. . .

Reply: Indeed, the term “swallow hole” is related to karst geomorphology. However, the Partnach stream is not infiltrating in a diffuse sink. Because of large blocks of the rockfall mass, the stream is sinking into a hole, comparable to a swallow hole in karst (Please see the Fig.1 at the end of our response). Similarities between karst systems and rockfall masses have also been published by Sinnreich et al. (2002). No revisions will be made.

page 6812, line 5: “the dye was dissolved in a 20 l canister. . .” Na-naphtionate has a solubility of about 240 g/l. For 5 kg you need more than 20 l! Did you use more than one canister ??

Reply: The dye was dissolved in the 20 L canister and the oversaturated solution was injected into the sinking stream, where the dye was instantly diluted in the turbulent water (discharge > 5 L/s). To avoid residues in the canister, it was rinsed a few times.

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page 6813, line 25: The coefficients of determination should be given for each gauging station as well as the other statistics (number of measurements, standard error, ...)

Reply: Revisions will be made and the information will be added.

page 6815, line 5: It should be explained more clearly how the discharge events with "... one clear input and one clear output signal..." were selected. What does it mean? What kinds of events were used? Snowmelt runoff? Rainfall only in the upper part of the Reintal area? In any case of rainfall induced runoff you have runoff from lateral torrents which interferes with the input signal.

Reply: We used only rainfall events for the evaluation of discharge events. We did not evaluate rainfall events that occurred under very unstable flow conditions, because the diffuse discharge peaks made it impossible to select related input and output signals properly. Precipitation data from the weather station at the summit of Mt. Zugspitze was used meaning that precipitation events were taken into consideration that occurred in higher elevated areas of the Wetterstein Mountains (the upper part of the Reintal area and surrounding summits). Indeed, there is some lateral surface runoff induced by precipitation events. However, we have observed that strong lateral torrents which strongly interfere with the input signal, occur only during some (high) precipitation events. But, of course, it would be desirable to have some more data (high resolution precipitation data and quantitative data about lateral runoff).

page 6816, line 3: The alluvial and rockfall sediments in the Reintal should be termed as postglacial sediments as in fig. 4

Reply: Revisions will be made.

page 6816, line 13: Low flow conditions are not related to baseflow in a hydrological sense. Better use "discharge" instead.

Reply: We will improve this in the revised manuscript.

page 6819, line 11: A recovery rate of 59 % for Na-naphtionate is a very high value! At
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this place a short discussion of the reasons of the loss of nearly 40 % should be done. And additionally, the best possible recovery should be estimated. 100% is unrealistic and therefore not the best guess!

Reply: We will add a short discussion about the recovery of the tracer.

page 6820, lines 5 ff.: Piston flow as a reason for short lag times is not mentioned.

Reply: Revisions will be made.

fig. 6: An approximate scale for the distance would improve the understanding of the figure.

Reply: Revisions will be made.

Reference:

Sinreich et al. (2002) Hydrogeologie einer alpinen Bergsturzmasse (Schwarzwasser-tal, Vorarlberg) [Hydrogeology of an alpine rockfall mass]. Beitr. z. Hydrogeologie, 53, 5-20.

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Fig. 1.

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