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Hydrology and Earth System Sciences
Discussions

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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The paper presents a very interesting and well described example for the hydrogeological characterization of an alpine rockfall aquifer. Some minor remarks are made that might contribute to better highlight the relevance of the assessed data.

Tracer test conditions and results could be described in more detail, in particlar those aspects from which major conclusions are inferred. Since sampling density during peak time is low, tracer recovery calculation strongly depends from only one or few sampling points. This uncertainty should be considerd when using high recovery rate

as reference for storage capacity. Has any tracer remobilization been observed during floods within the 3-week sampling period that would confirm the storage hypothesis?

While the main peaks of SP-R2 and SP-R3 are due to surface flow (which indeed doesn't become very clear from the text), the identified second peaks are associated with subsurface flow arrival. As they are represented by only one single measurement each, particular caution should be exercised for interpretation. Not only the measurement error of the apparatus determines the reliability of this data but rather possible variations in the background value. Fluorescence intensity at the Naphthionate's wavelength can easily be influenced by fluctuations in organic matter content and turbidity, respectively, if transitory conditions are met. It appears from Fig. 9 that there might be some small rainfall events having occurred following injection. How can be excluded that such hydraulic variations are responsible for a temporary increase of natural background, or tracer remobilisation within the rockfall aquifer, respectively. Has the evolution of background values been tested prior to the injection or over other flood events?

Have karst springs in the lower part of the valley, if any, been observed for tracer arrival in order to check potential drainage from the rockfall aquifer to the underlying karst aquifer?

I did not manage to deduce from the manuscript if there occurred quasi steady-state conditions at which a water balance of the rockfall aquifer system could be established, including potential water loss to the karst aquifer.

Is the time delay of floods purely an advective phenomenon or might some kind of Piston effect within the heterogeneous rockfall aquifer play a role?

Do recession coefficients downstream the rockfall represent solely the emptying of the according reservoir, or to which extent could these values be influenced by the continuous input from the Partnach spring and thus by the characteristics of the karst aquifer.

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The reviewers have already mentioned the missing comparison with other studies within a same context. There are indeed only few studies available regarding this topic. For instance, we used a similar approach for characterizing the hydrogeological conditions of an alpine rockfall aquifer in the same region (Sinreich et al., 2002), obtaining information on flow velocity within the rockfall mass, recession coefficients of the draining spring, time delay of flood events, input-output discharge relationship as well as interaction with the underlying karst aquifer. It would be particularly interesting to compare the finding of both studies and to discuss similarities and differences in their results. Links to related studies would furthermore help to highlight the unique features of the present one.

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

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 6805, 2014.