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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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This work is important because high-alpine areas are difficult to access, and therefore, any data or findings in such a study should be published. Also, high-alpine hydrological settings are particularly sensitive to climate change because of decreases in snowpack that feeds headwater streams. See my main comments below and minor comments added as sticky notes in the supplement.

1. A more extensive literature review is needed to describe similar previous work in alpine catchments, especially those in similar environments, to show what is unique

about this study and what new insights have been gained. The only such comparison described is a study of discharge ratios by one of the authors of this paper (Schmidt and Morche, 2006). It's important to communicate how this paper will advance hydrologic science in some way. The Introduction states that high-alpine catchment research remains incomplete because of poor accessibility; however, this statement is not well supported. But if this statement is true, then it won't be difficult to describe what is new in this paper.

2. Does the karst aquifer play an important role? The importance of the karst aquifer and associated conduit network is not discussed until page 6821. Two sentences allude to this but don't go into any detail (6821 lines 17-18, 25-26). It's not clear if this discussion applies only to the karst aquifer that feeds the karst spring GS-RU, or if it also might apply to the karst that underlies the alluvial/rockfall aquifers, which might be hydraulically connected. If this aquifer seems to have a well-developed conduit network, then this should be discussed earlier in the paper.

3. Tracer test – It wasn't totally clear that breakthrough curves for SP-R2 and SP-R3 might be mostly surface-water flow before 75 h until I read it a few times. Along with a little more explanation in the text, it would be helpful show on fig 7 which parts of the curves represent all groundwater flow and which parts represent mostly surface-water flow. Also, the secondary peaks representing subsurface flow are small, and each spring has only one sample to identify the peak. So, is the peak magnitude larger than measurement error? My guess is that the peaks are real because there seems to be very little noise in the overall breakthrough curves. Also, the peak in the downstream site is lagged behind the upstream site, which might tell us about groundwater velocity between the two springs.

4. A plot or table of recession coefficients for the 15 events for GS-RU and GS-RD (6821 lines 21-23) would be useful and would help support the discussion that follows. Box plots might effectively show the difference between the two sites. Also, with 15 values it might be helpful to report the mean, median, and standard deviation of recession

coefficients, or just show the data spread with box plots. Some discussion of the differences between the karst and alluvial/rockfall aquifers is presented, but this could be expanded a little. A more thorough comparison of metrics for GS-RU (karst) and GS-RD (alluvial/rockfall) would quantify differences in karst versus alluvial/rockfall aquifers. This comparison could be used to better show that the alluvial/rockfall system is a much better flood buffer that the karst. Also, are there other karst alpine catchments that don't have this buffer and are more susceptible to flooding? This is one idea to help you describe the importance of this study area in the broader context, if possible.

5. There are a lot of discharge metrics listed in the supplement. Are there any scatter plots of these data to help illustrate what is being described in the "Discharge characteristics" section? When you try plotting data in as many ways as you can think of, you often see interesting data relations that weren't previously apparent. Some of these plots might be useful for the paper (or the supplementary information) and might strengthen your conclusions.

6. In the Conclusions, I would like to see a better discussion of the how the main findings of the research come together to tell us something new about a high-alpine valley system. For example, I don't see anything about how the tracer data fit with the flow data and what conclusions can be drawn from the combined results.

7. Word use – The word "dampening" describes making something wet. You probably want to use the word "damping" or "damped," which describe a decrease in amplitude of a wave or oscillation.

8. Fig 6 – The two alluvial plains and the two rockfall deposits are sitting on top of something that looks similar but is not labeled. What is this material overlying the karst aquifer? What are the dashed lines?

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/11/C2834/2014/hessd-11-C2834-2014-

supplement.pdf

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