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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Linking baseflow separation and groundwater storage dynamics in an alpine basin (Dammagletscher, Switzerland)" *by* F. Kobierska et al.

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REVIEWER 2 – General comments

REVIEWER: The strong point of the study is the intensive data sets on which authors have formed their model. However, how the idea has been implemented is very questionable. Many parts of the manuscript need to be revised as they are either difficult to understand or they have been poorly explained. To my view point, the paper requires major revision. The parameters which are calibrated in this study are not defined clearly. Also, the value for some of these parameters such as residual water

storage are not known. It is suggested that authors come up with a table in which all the calibrated parameters and their values are explained.

AUTHORS: The issue of the residual water content was also raised by reviewer 1. We have added details and justifications regarding this parameter (lines 413 to 420 and a new Table 4).

REVIEWER: It is assumed that exfiltration occurs from the side of the river due to gradient. Line 7 page 12199 states that infiltration is happening from stream to the aquifer. This is not clear if this infiltration is assumed to be vertical from the bottom of the river to aquifer or it can happen laterally as well. If it is also lateral, then assuming a constant width is not a correct assumption and this issue may explain the large contrast between the modeled width (5 to 14 meter) and the one the one reported by another research (24 meter).

AUTHORS: The infiltration was assumed to be vertical from the bottom of the river to the aquifer. This whole section has been deleted because we realized that it brought more confusion than added value.

REVIEWER 2 – Specific comments

REVIEWER: Page 12195 line 9: The word previous should change to next.

AUTHORS: Done (line 254).

REVIEWER: Page 12195 line 9: It has been written that equations (1) and (2) yield equation (3). This statement does not seem to be true. Is it assumed that the discharge due to glacier melt is ignored. If this is so, this section should addressed why glacier discharge was excluded.

AUTHORS: Discharge due to glacier melt is not ignored. It does not need to be determined explicitly because it is instead estimated from end-member mixing of EC (equation 3). Equation 1 is solved for the melt rate, and this is substi-

tuted into Equation 2, yielding Equation 3 (more explicit formulation lines 254-256).

REVIEWER: Line 24âĂŘ25 page 12205: why is it difficult? This statement needs a justifiable reason.

AUTHORS: Reviewer 1 asked a similar question regarding the passive aquifer which we now exclusively call 'non-contributing'. It is difficult as both the depth of this storage and its hydraulic properties are unknown and technically challenging to determine. This point has been added to the manuscript (lines 530-531). It however does not affect the validity of this study as this deep groundwater flow is an 'invisible' part of the hydrological balance in this first order catchment.

REVIEWER: It is highly recommended to avoid repetitions. Page 12197 section 3.2.3 should be revised as two sentences are saying the same thing.

AUTHORS: OK, we have improved this section (now section 3.2.4).

REVIEWER: Equation (9) assumes that gradient is one. However, there is no explanation why this assumption holds.

AUTHORS: We assumed that infiltration happens into completely saturated media with no extra hydraulic gradient (surface water depth is neglected). This part has however been deleted from the initial manuscript.

REVIEWER: I disagree with lines 18:20 on page 12201. The model underestimates most of the time and I suggest that the explained reasons in section 5.4 to be presented in section 4.2 to describe this inadequacy.

AUTHORS: Yes, the model under-estimates most of the time; except when streamflow is almost uniquely constituted of glacier melt. We now mention those points more explicitly in Section 4.1 and refer to the discussion for further details (lines 422-429). Mid-

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summer days with high peakflows and substantial flow amplitude strongly influence the calibration procedure, whether based on the Nash-Sutcliffe efficiency or relative error.

REVIEWER: The position of the river in figure 6 should be known. It is not obvious in that picture.

AUTHORS: We have added the position of the stream to the figure (now Figure 7), including groundwater springs in H1, H2 and H3. The stream outline also illustrates the difficulty of defining stream width for such a braided network of stream reaches.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 12187, 2014.