The study is well-designed, clearly reported, the conclusions are supported by the data and results. So just a few comments from my side:

Reply: We would like to thank Uwe Ehret for his suggestions and are happy to read his positive comments on our manuscript. In the following, we replied to each point raised by the reviewer and indicated how we will implement his suggestions in the revised manuscript.

Title: The study has a strong focus on the concept of dominant runoff processes; in fact all of the experiments include DRP–based choices. This should be reflected in the title. E.g. 'How can expert knowledge increase the realism of conceptual hydrological models? A case study based on the concept of dominant runoff processes in the Swiss Alps.

Reply: Thanks for this suggestion, which will be embraced in the revised manuscript.

P3L3: applied instead of solved (or 'used as constraints')

Reply: Agreed.

P4L31 pp: The connection between the text, Table 2 and Figure 3 should be improved:

Reverse the order of a), b) and c) in Fig 3 to match the order of Table 2

In Fig 3, add some textual info of the meaning of the RT's (e.g. column 3 of Table 2)

Add some more explanation about the maps in Fig 3 to the text (e.g. what is the raw resolution of the maps)

Reply: Agreed. In the revised manuscript we will reverse the order of the process maps in Fig. 3, extend its legend and integrate more information in the caption.

P5L20 and P25 Table 2: It is not entirely clear to me how the mapping from 9 → 5 and 12 → 5 types was done.

Reply: The nine DRP classes (HOF1-2,SOF1-3,SSF1-3, and DP) of the mapping approach after Müller et al. (2009) are reclassified in five runoff types (RT1-5) according to Table 2. In addition to the same 9 DRP classes used by Müller et al. (2009), the original method of Schmocker-Fackel et al. (2007) allows areas where water is artificially drained (D1-3) to be identified, provided that maps of tile drain systems are available. As these were not available for our study catchments, the original 12 classes get reduced to nine, and the same reclassification criteria as for Müller et al.’s (2009) approach were used (Table 2). we will add this information in the revised manuscript.

P6 section 2.2.1: So PREVAH was used to initialize SSM. How was SUZ initialized?

Reply: Each simulation was started (at least one day before the beginning of the rainfall event and) sufficiently far from possible previous events, so that it was possible to assume that no overland flow and no subsurface flow was occurring in the first time step. Consequently, SUZ was set equal to 0. We will add this in the revised manuscript.

P7 section 2.3.1: How was GS1H determined?

Reply: GS1H was determined based on expert knowledge. Considered the size (from 0.5 km^2 up to 2 km^2) of the subcatchments, into which the main catchment was subdivided, an initial range between 1h and 3h was considered to be plausible for the storage constant governing the concentration of subsurface flow. The same initial ranges were also used in Antonetti et al. (2017). We will therefore add this reference at the end of the sentence in question.

P7L12: Can you explain in more detail the optimization against generalized response curves?

Reply: Based on the results of the sprinkling experiments, on physical properties of soils, and on the field expertise of the authors who mapped the runoff types in the investigated areas, plausible value ranges were defined a priori for each parameter of the bottom-up setup (Table 4 of Antonetti et al., 2017). Contextually, idealised response curves were defined for each runoff type (Figure 5 of Antonetti et al., 2017). These curves are idealised results from the sprinkling experiments and represent the expected behaviour of the correspondent runoff type in terms of intensity to runoff contribution. The initial ranges of each model parameter were defined a priori for each runoff type, according to the characteristics of the DRPs belonging to it (Table 3 of Antonetti et al., 2017). With regard to the partitioning of runoff within those runoff types, where different DRPs can occur (e.g. runoff type 2, where both SOF2 and SSF1 can take place), the parameter ranges were defined in a manner that allows equifinal combinations to be considered (Beven, 2006). As a result, overland flow and subsurface flow can be partitioned in different ways, provided that the total contribution to runoff reflects that of the correspondent response curve. These ranges were then optimised against the characteristic response curve of each runoff type by considering only the 1% best runs of a Monte Carlo simulation with 10’000 runs. Since response curves instead of hydrographs are used for the optimisation, the root mean square error (RMSE) was used as objective function.

In the revised manuscript we will extend the description of the optimisation against the generalised response curves. We will try however to keep the explanation as short as possible by referring the reader to our previous study (Antonetti et al. 2017).

P7 section 2.3.2: How was the routing parameter chosen for the top-down approach? Same as for bottom-up?

Reply: For the bottom-up setup the runoff routing in the channel was calculated with the hydraulic approach after Schulla (1997), i.e. by considering the flow times calculated with a Strickler coefficient of 30 $m^{1/3} s^{-1}$. For the top-down setup no explicit routing parameter is defined, as routing is coupled with runoff generation and concentration (as is done currently in PREVAH). Therefore, the storage constants K0Hi and K1Hi (i = 1-5) account also for routing. Their values are allocated based on the strategy after Gharari et al. (2014), which is described in section 2.3.2 of the manuscript.

P11L6: overestimate instead of underestimate

Reply: Of course! We really appreciate the attention the referee put in reviewing our manuscript.

P11L23: Can you explain 'interaction' in this context?

Reply: Within the ANOVA framework, an interaction is linked with the concept of covariance and is defined as the effect of a factor that depend on the effects of one or more other factors (see for instance Köplin et al., 2013). We will specify this in the revised manuscript.

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