

Interactive comment on “Monitoring snowpack outflow volumes and their isotopic composition to better understand streamflow generation during rain-on-snow events” by Andrea Rücker et al.

Anonymous Referee #1

Received and published: 14 March 2019

General comments: The study of Rücker et al. presents an analysis of rain-on-snow events in a Swiss Pre-Alpine catchment for two winters. The focus of this study lies on characterizing the snow conditions at the lysimeter measuring sites and analysing the snowmelt response with respect to the discharge response. Moreover, an isotope-based hydrograph separation provides estimates for rainfall vs. snowmelt contributions to stream runoff. In this context, the present work contributes to a better process understanding of rain-on-snow events, being important for flood management and model calibration. The manuscript is well structured and the language quality is appropriate. Although the manuscript sections seem to be well balanced to me, surprisingly, I could not find research hypothesis at the end of the introduction section. These would make

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the study much stronger and would directly lead to the titles already chosen in the result section. With respect to the result and discussion section, I noticed that the discussion part is sometimes too short and references could be added. This lack probably results from merging result and discussion section. A last point addresses the use of tenses. I recommend to the authors to check again the when present tense and past tense was used. For example, results are normally described in past tense, which sometimes is not the case.

Specific comment: Page 3, Line 11: provide a reference for the effect of the canopy structure Page 3, Line 21: please comment whether sublimation plays a role in this context as well Page 3, Line 29: snowmelt contribution Page 4, Line 1-4: please rephrase; how do you justify the rain snow transition zone? Page 4, Line 8: add more details, such as elevation of these measuring stations Page 5, Line 7: please argue on the representativeness of your lysimeter sites with respect to the catchment (aspect, slope, elevation). What was the reason behind selecting MG and MF sites so close to each other? Page 5, Line 13: 30 m difference in elevation is redundant with line 8 Page 6, Line 13: please specify the improvements made for this site Page 6, Line 23: please comment and add in the text on fractionation though evaporation? Could the sampling bottles automatically closed after filling? Page 7, Line 24: did you use a recognition software to transfer webcam pictures into snow depth data? Page 7, Line 25: was HG site subject to blowing snow? Page 8, Line 3: please use references to support these criteria Page 8, Line 15: were collected Page 10, Line 7: please use a reference for the Gaussian error propagation Page 11, Line 11: please characterize these cold conditions, how was the mean air temperature? Page 12, Line 6: replace “several times” by a number to better quantify Page 14, Line 6: replace by “Further four ROS” Page 15, Line 15: provide some statistics when reporting statistical significance Page 15, Line 21: 200-meter is already known and thus redundant, please remove Page 16, Line 9: provide some statistics when reporting no statistical significance Page 17, Line 8: to which processes do you refer to? Please rephrase. Page 17, Line 21: provide some statistics when reporting no statistical significance Page 20, Line 4: be more quanti-

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tative with respect to variable responses and lag times Page 23, Line 4: 200-meter is already known, please remove Page 23, Line 10-11: this is not clear. Is the elevation gradient defined by your sites not large enough to show the elevation effect? Page 23, Line 24: provide results from a statistical test to show the similarity in isotopic composition Page 30, Line 6: replace by "By using" Page 30, Line 10: replace by "compared to that of open grassland" Page 30, Line 18: as this is the summary, it would be helpful to repeat the initial criteria how you defined the ROS events (precipitation amount, initial snow depth threshold) Page 30, Line 26: IHS is already introduced before Page 31, Line 23: the correct co-author name is McNamara

Fig. 1: add a map of Switzerland locating your study site. Why is the forest in the lower part of the map dark green? Shading effect of the underlain hillshade? (in this case, hillshade data not present in the legend) MG seems to lie in the forest.

Fig. 2: please make air temperature line thicker and improve grey bars, which are not so visible

Fig. 5: The snow depth subplots could be taller to increase visibility

Fig. 7: what is the meaning of the grey dashed line in all subplots?

Fig. 8: why are event #3 and #4 results unrealistic?

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