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Hydrology and Earth System Sciences
Discussions



# *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.

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**General comments:**

The paper presents very interesting and current topic about snowpack outflow contribution to the catchment outflow during rain-on-snow (ROS) events. The authors identified ten ROS events during two winter seasons, where the effect of snow cover and further snowpack outflow to the stream were analysed. Authors employed two-component hydrograph separation method using natural stable water isotopes and enhanced system of water sampling. I like the study very much, because understand-



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ing of the hydrological processes during ROS is still not sufficient and this study aims to contribute to this knowledge. It is an interesting study and worth to publish in HESS. Nevertheless, I recommend to do some minor revisions and I also have a couple of suggestions to improve the study.

My major point to the study is that the authors should present results from the hydrograph separation and provide more information about snowpack outflow composition. Since the isotopic content of rain and snowmelts during ROS events were sampled, the rainwater contribution in the outflow can be easily calculated. The authors can also provide the separated hydrograph with all the components.

The authors define in section 2.2.1 the ROS event. Maybe I just missed something, but from this definition it seems that duration of ROS equals duration of rain. This does not match with the values in Tab. 1 (see columns *Start time, End time* and *Rainfall duration*). This issue is also connected with total ROS outflow volumes. Please describe it clearer.

The *Introduction* section usually provides in the end some basic goals of the paper. I miss this part in the particular section. Please reformulate the last paragraph (Page 3, lines 30 – 33, Page 4, lines 1 – 3).

Although, I am not a native english speaker, I recommend some proof reading regarding the language.

**Specific comments:**

- Please use elevation units as “m a.s.l.” and not “m asl”.
- Please present what time zone do you use (UTC, CET, etc.).
- Figure1: Can you add an information about coordinate system of the map and





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how far is HG site from the catchment. You should also add a small map of Switzerland, where the study site is located.

- Lot of technical information regarding the field monitoring system is provided (page 5, lines 15 – 18, page 1 – 5). It would be beneficial to better readers clarity if you present these information in tabular form. The sketch or photograph of the monitoring system would be also very practical and provide better view how the system works.
- If you state just water stable isotopes as such, do not use $\delta$ symbol, but only $^{2}$H and $^{18}$O (Page 3, line 3). Delta symbol refers to some defined standards.
- You mention that the snow was sampled by a snow tube (Page 7, lines 27 – 28). Do you use any standardised tube? What is the material of the tube?
- Please be consistent with presenting the time intervals. You often mix numbers and text information, like 10-minute x ten minute (i.e. Page 7, lines 7, 9).
- Page 16, line 1: According to Fig.2 the snow depth at HG does not look 97 cm deeper than MG.
- Page 16, line 14 – 15: Do you have any isotopic signature results of the throughtfall? Can you compare it with rainfall on the open sites?
- Page 18, line 2: How did you estimate the cold content of the snow? Did you also measure the snow temperature or did you just guess it from the air temperature? If you consider just mean air temperature, how long prior to the event? Maybe you should rather use cumulative temperature from last x hour. Nevertheless, this statement is quite tricky, because the higher cold content does not always mean that more incoming rainwater is stored in the snowpack. Water storage is more related to the snow stratigraphy and layering.





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- Figure 4: Can you add $r^2$ values to all subplots?
- Page 20, line 4: How do you define lag times?
- Page 20, line 6: How do you estimate saturation of the snowpack?
- Table 3: What does represent the last column (Rainfall MG) of the table? There are used two terms in figure 6 – *rain* and *rain-on-snow*. Please be consistent with the naming. There are presented results of different water contribution to the catchment outflow only during peak discharge. Can you also present results of outflow composition from the entire event period?



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