Interactive comment on "Quantification of runoff generation from a combined glacier and *páramo* catchment within an Ecological Reserve in the Ecuadorian highlands" *by* Verónica Minaya et al.

Anonymous Referee #2

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The submission deals with runoff generation and water sources in a high-mountain catchments dominated by a glacier and characteristic Andean grasslands (paramo). The work reports sampling of hydro chemicals and stable water isotopes along the stream and for one event at the catchment outlet. This data is supported by precipitation, ice, and spring sampling. The approach is not novel, yet the landscape and the crucial role of grasslands makes this study of interest for the scientific community, especially as high-mountain and glaciated catchments are under increased and constant stress. Yet, I wished that the senior authors would have invested more time in their student's submission rather than passing the work on to the reviewers. I feel that the paper needs quite substantial revisions before it can be accepted. I think that this work

can be a substantial contribution to the hydrological community after careful revision.

Major concerns:

i) What I am most critical about is the lack of a clear story line; especially the result section offers a bunch of data that were presented rather unstructured and it was hard to tease out the important bits of it. Why is what kind of data presented? I often felt lost, maybe also due to the lack of a proper description of the sampling.

ii) I felt confused throughout the read. There was plenty of sampling, along the stream, for events etc. What is clearly needed is a table and a more detailed description of the sampling.

iii) I felt that the use of the sampling along the stream was never really detailed used and the core of the works ends up as one hydrograph separation (which lacks the proper methodological description). What precipitation was used as end-member etc.?

iv) I am somewhat critical about the lack of precipitation samples, especially since they show quite some spread and plot below the LMWL. How does the station where the LMWL was recorded compare to the local conditions (such as elevation etc.). This could lead to a clear offset of the true local LMWL. There is no clear description where ice was sampled. Three samples is somewhat small, but at least the spread is small too.

v) The landscape units are poorly described in the manuscript, e.g. Figure 1 does not even present the paramos.

vi) The figures quality in general. Figures 1-3 are acceptable quality, figures 4-9 are not.

Minor concerns: The English could use a revision. The sentences are often nested and overly long. The title is not precise and too long. Please check the proper use of altitude, I think the differentiation between altitude and elevation needs some attention, cf. McVicar and Körner (2013), Oecologia. "On the use of elevation, altitude, and

height in the ecological and climatological literature" The abstract needs some rework. Paramo is never explained. L14-16 lacks precision. The results need to be more detailed.

P1L33-34: "…river's….resurgence" this is unclear. P1L39. The concern…. Check the grammar. P2L10ff: Please make the research gap clearer, really try to make an effort why exactly this study is needed. P2L15ff: Restructure and specify the research question (or use hypotheses). P2L33: "Location". For me this seems not right, as there is much more described here, such as catchment properties. P2L34ff. It was not always clear to me if the individual information was for the catchment, or the region. Furthermore, I found it difficult to follow since the authors jumped around in there references to distinct elevation ranges. What is low, what is high, etc. Please consider restructuring the section 2. P2L45-47: Not sure if some information that is clearly not linked to the catchment is needed. P4L10-11. Make it easier. Subcatchment#2 flows through…. and subcatchment#9… P5L4: Please introduce a table where details are described. P5L5: Every 200m, you leave it for the reader to guess. You should clearly state that this was sampling along the flowing stream channel. P5L10: reference for the method P5L14: You mean catchment outlet? How many events? P5L16: When were the precip samples taken? P5L29ff: The text would profit when transformed to active style. The PCA was not mentioned in the methods. P6L1: The header is unclear, I am also not sure what exactly was done with this mixing analysis. I stay confused. P6L29: Maybe "end member" would be a better term? P6L30ff.: See major concerns. Please avoid methods in the results, describe everything in section 3. P7: Figure 4: Box plots with 3 and 4 data points are sketchy. The quality of the figure needs to be improved, line width, font size, a, b etc is not mentioned in the captions P8L2: Avoid introductory sentences in the results paragraph. Straight to the point. What is important? P8L7-8, this should be mentioned in the study site. P9: Please reconsider the presentation in this figure. You leave it to the reader what might be of importance. Furthermore, the figure is not understandable just based on the captions. Font size, line width etc. should be improved. P11: completely revise P12L2-3: You refer to event and events.

How many? P12L2: 2mm rain is not an intensity. Was it just one event that had 2mm? These lines are confusing, I cannot figure out what was done and sampled (see suggestion about tables earlier). P12L2ff. You do not mention the LMWL here. How does the LMWL relate to the local conditions? How many km away? On what elevation? Etc. P13: The mixing plot and hydrograph separation section should be merged. P14: It is not clear here what end-members are used, but a merger with the mixing diagram section will help. Also consider presenting this information in the methods (which may not work, in case the mixing diagram was used to determine the end members, so just results in that case). P16L9ff. The discussion here needs some more work. You need to really make the point how your results improved both, the understanding of runoff generation in the catchment beyond previous understanding, and how this makes the work relevant for the same landscape at other places, and how the results compare to other researcher's work. The latter is needed to show the importance of the results for the community, you can close the story that you opened at the end of the introduction, where you should state (earlier comment) why this work is needed.

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