Hydrol. Earth Syst. Sci. Discuss., 11, C2758–C2762, 2014
www.hydrol-earth-syst-sci-discuss.net/11/C2758/2014/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Tracer-based analysis of spatial and temporal variation of water sources in a glacierized catchment" *by* D. Penna et al.

Anonymous Referee #1

Received and published: 28 July 2014

General comments:

The authors present an interesting case study about the spatio-temporal variation of the most important water sources contributing to runoff and groundwater recharge in a high alpine catchment in the southern European Alps. The study presents a unique and extensive dataset of stable isotopes and EC measurements in the study area. The study has shown that snow, not surprisingly, plays a crucial role for the generation of runoff and groundwater recharge in the mountainous study area. It is well known that there are large uncertainties of snow stable isotopes for the investigation of the water sources in high alpine environments. An enrichment of heavy isotopes due to intermitted melting processes has been reported (Dietermann and Weiler, 2013). Surprisingly, the snow stable isotope data, especially the samples from spring and summer snow

patches, show no fractionation signal in the presented study. Is this related to the particular sampling locations (e.g. shading)? Furthermore, the intercepts of the different snowmelt samples differ from each other. The authors have identified a predominantly oceanic origin of the air masses in the study area. However, it is well known that the Southern Alps can have significant precipitation inputs originating from Mediterranean air masses (e.g. Winter 2013/2014). I will encourage the authors to discuss the results and the uncertainties of the presented snow stable isotope data in more detail. The study nicely characterizes the important runoff generation processes in the study area using classical hydrological tracer methods. The study presents no new methods or the identification of unknown processes. The tracer data nicely confirm fundamental process knowledge in alpine environments. The scientific value of the study lie therefore in the characterization of the hydrological runoff generation processes in an insufficient investigated study environment using environmental tracers. The presented sampling approach and the methods used are valid. However, the authors present lot of speculations to explain the hydrological processes from the collected data. I kindly invite the authors to recheck the citations and the references list very carefully in the manuscript. I found references not cited in the references list (e.g. Page 4893, Line 1; Page 4894, Line 11; Page 4897, Lines 5 and 12). Furthermore, the structure of the results and discussion section could be reconsidered. I recommend the presented study for publication in HESS after revising the submitted manuscript based on the suggestions of this review.

Specific comments:

Page 4884, Line 2: Please introduce Table 1 and Figure 1 together for a better overview of the study area and the locations.

Page 4884, Line 10: Please provide approximate elevation.

Page, 4884, Line 23: Most likely it is not appropriate to call a flood event in September a ROS flood. Since those floods are usually characterized by an extensive snow pack all

over the catchment area, but a general definition of those floods is lacking. How many snow, and on what elevation was the snow, line prior to this event? Please clarify.

Page 4884, Lines 28-29: Please use italic fond for vegetation names.

Page 4885, Lines 6-11: This section could be shorter.

Page 4886, Line 1: Please shortly mention the uncertainties for a quantification of the peak flows during the floods mentioned before derived from those rating curves.

Page 4887, Line 7: There is an “a” missing prior to 1 m?

Page 4887, Line 10: Fall 2012, instead of fall 2013 at the end of the sentence?

Page 4888, Equation 1: The equation for calculating the deuterium excess is wrong in the manuscript. The proper equation is: d-excess = delta D – 8 * delta 18-O. Please check if the calculations were done with the correct formula.

Page 4889, Line 1: Please mention the different water components (snow, GW and rainfall) for more clarity.

Page 4891, Lines 1-20: This section could be shorter. The references with the equations are sufficient. The equations in this section could be presented in a table for example.

Page 4893, Lines 5-6: The unknown factors could be mentioned in the text.

Section 4.3: Please provide a more detailed discussion about the challenges and the uncertainties associated with the sampling of snow stable isotope data. See therefore Dietermann and Weiler (2013), for example.

Page 4894, Line 12: Year of the citation Cable et al. is wrong in the text or the references list. Please check.

Page 4895, Line 17: Section 4.9 does not exist. Probably section 4.8 is the right one.

Page 4896, Line 14: Section 4.9 does not exist. Probably section 4.8 is the right one.

Section 4.6 would be perfect as an introduction at the beginning of the results section.

Section 5 and Section 6 could be merged together, since there are repetitions of concluding remarks.

Section 6: I suggest arranging the conclusions the same way as in the objectives section.

Page 4904, Line 3: I think the uncertainty of the snowmelt contribution to groundwater recharge is not needed at this point.

Page 4904, Lines 7-16: From my point of view a paper is a discrete study and therefore this extensive outlook for following studies is not appropriate.

Page 4904, Line 24: Is there a “and” missing?

Page 4905, Line 2: Please check the DOI of this citation.

There are some references that are missing in the main text of the manuscript (e.g. Page 4906, Line 4; Page 4906, Line 27, Page 4906, Line 30).

Page 4908, Line 1-4: Please check if this paper is already available in HESS

Page 4914, Table 4: Please check the intercept of stream water (tributaries) and groundwater (negative values?).

Page 4917, Figure 2: For more clarity and to reduce the caption text, the number of samples could be included as “n=65”.

The caption text of a number of tables and figures could be shorter. The second sentence of Table 5 is not needed, since the computation of the uncertainty is already described in the main text of the manuscript, for example.

Page 4921, Figure 6: The size of the letters in the figure could be bigger in the final version of the manuscript for more clarity.

Page 4923, Figure 8: For more clarity and to reduce the caption text, the number of

samples could be included as “n=8”.

References

Dietermann, N. and Weiler, M.: Spatial distribution of stable water isotopes in alpine snow cover, Hydrol. Earth Syst. Sci., 17, 2657-2668, doi:10.5194/hess-17-2657-2013, 2013

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 4879, 2014.