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Hydrology and Earth System Sciences
Discussions

# *Interactive comment on* "Where does streamwater come from in low relief forested watersheds? A dual isotope approach" *by* J. Klaus et al.

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The Klaus et al. manuscript presents the isotopic signatures of different water sources affected by evaporation, which are further used as end-members to identify runoff generation mechanisms in gentle slopes catchments in South Carolina, USA. I found the manuscript interesting because it provides new information about the water cycle o forests located in a low relief topographic setting. I have some comments that I would like the authors to address, which may help to improve the contents and potential impact of the paper.

Response: We would like to thank Lysette Munoz Villers for her helpful comments on our manuscript in HESSD.



Methods. Section 2.2. I will second Dr. Markus Hrachowitz comment with regard to the measures taken to prevent evaporation/fractionation of the precipitation and throughfall samples (see also my comments below). Please provide this information in the manuscript.

Response: Regarding the measures to prevent evaporation and fractionation we attempted to go to the field directly the day after rain events to take the sample, often shortening the weekly sample interval. Nevertheless this was not always possible. We did not add oil to the sampling. The rainwater was funnelled through a small pipe in a sampling bottle, this should at least reduce impact of evaporation/fractionation. In addition, our observed LMWL is in agreement with observations throughout the region [slope of 7.04 and y-intercept of 8.11 (R2=0.847) for the period 1997 to 2009 (C. Romeneck, 2012, personal communication)]. This is suggesting little influence of fractionation on the sampling. We will state that in the manuscript.

Section 2.2, Page. 2619. Please also mention the sampling period over which the stream water, riparian groundwater, throughfall, and lateral flow were collected.

Response: We will improve the description of the sampling and give the sampling period for individual water cycle components in the revised manuscript.

Results. Section 3.1, Page 2620. The high positive O18 and 2H values reported for precipitation surprise me somewhat. In particular, there is one very enriched value that plots below the LMWL (Figure 4, panel a), which looks suspicious to me and makes me wonder if that sample could have been affected by evaporation. I would then suggest calculating the d-excess values (see my comment below) of all samples as a way to identify evaporatively impacted samples. In addition, please check the expected range for 18O and 2H isotope ratios at your study site or a nearby place. If the samples turn out to have been affected by evaporation, I suggest you to simply remove them from the data set.

Response: We completely agree with the reviewer that some suspicious samples with

very low deuterium excess (that are also associated with low precipitation depth) can be impacted by fractionation and should thus be omitted in the calculation of the LMWL. In particular the one sample outlined by the reviewer, and 2 other samples that we identified with a very low deuterium excess.

Section 3.2. Page 2620. I think it is very important to include in this paper a figure where the GMWL is plotted together with the LMWL; given the climatic conditions at your study site, the latter likely has a lower slope and intercept as compared to the GMWL. This would also be very useful for future comparisons across sites with similar climatic conditions.

Response: This is a good point. We will add a figure including the GMWL and LMWL in the revised version to allow future comparison across sites with similar climatic conditions.

Further, I think the authors have a great opportunity to make use here of the Deuterium excess (d-excess) parameter as a measure of the degree of evaporation enrichment. D-excess is a measure of the relative proportions of O18 and 2H contained in water, and can be visually depicted as an index of deviation from the global meteoric water line (GMWL: d-excess =10) in 18O versus 2H space (Dansgaard, 1964). Hence, I encourage the authors to present in this section the d-excess values of the different water cycle components (stream, throughfall, etc.), and also to refer to them in the Discussion (Section 4.1).

Response: In general we agree that the Savannah River Site, or the Atlantic Coastal plain of the US, seems to be a good site to make use of deuterium excess. Nevertheless, we think that adding results and discussing the impact of evaporation in detail via the use of deuterium excess would distract from the scope of this paper, since the objective is the use of the dual isotope approach to constrain a conceptual model of runoff generation mechanisms.

Figures. Figure 3. Streamflow is plotted in l/s in log scale (left y-axis) in panels b, c



and d; however, for consistency and to facilitate comparison with rainfall (panel a), I suggest to plot the streamflow in mm/d. I observed that panels c and d have the same scale in the right y-axis, but I am not sure if panel b does. If not, please correct.

Response: These are good points, we will revise that.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 2613, 2014.