Hydrol. Earth Syst. Sci. Discuss., 11, C636–C639, 2014
www.hydrol-earth-syst-sci-discuss.net/11/C636/2014/

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.

M. Hrachowitz (Referee)

m.hrachowitz@tudelft.nl

Received and published: 25 March 2014

The manuscript "Where does streamwater come from in low relief forested watersheds? A dual isotope approach" by Klaus et al. analyses the utility of evaporation water lines of different flow generating components of a catchment to develop a conceptual understanding the system. The suggested method is a neat and to this point ignored extension of the utility of EWLs at the catchment scale. The paper is well-written and well-structured and is following a clear and logical red line. I think that the presented method will raise quite some interest in the community and may be very valuable for conceptual understanding in otherwise data scarce regions. I can only think of one issue that may further strengthen the paper: although to some extent given in

figure 5, it would be interesting to more explicitly show how the EWLs (in particular that of stream water) respond to changing wetness conditions. In other words, can a shift in the slope of the stream water EWL be observed with changing wetness, thereby indicating changing contributions from the different components (i.e. groundwater, shallow subsurface,. . .)? An analysis like this could quickly be done by splitting up the data set into 2 or 3 bins according to increasing stream flow (or antecedent precipitation), which could then be linked to and discussed with results from papers that also investigate the temporal dynamics of source components (e.g. Aubert et al., 2013; Hrachowitz et al., 2013; Heidbuechel et al., 2013), thus bringing this manuscript into an even wider context. Apart from that I do only have very minor comments and suggestions as given in detail below:

1)P.2615,l.8: here the terminology seems not entirely correct – I would think riparian zone water can be mobile as well. Please rephrase.

2)P.2616,l.15-16: I would be glad if you could add Hrachowitz et al. (2011).

3)P.2617,l.10: average annual?

4)P.2617,l.13: average annual? Please also make sure to always express fluxes as rates, i.e. [L/T]

5)P.2617,l.14: how was potential evaporation calculated?

6)P.2617,l.16: not sure the term "potential transpiration" exists and makes sense.

7)P.2617,l.18: 10 and 16% of what? Is interception set equal with interception evaporation?

8)P.2618,section 2.2: not entirely clear which time periods were sampled

9)P.2618,l.15-17: how many events were sampled?

10)P.2618,l.17-18: given the weekly interval and the relatively elevated potential evaporation, was fractionation in the sampler accounted for?

11)P.2618,l.18: should this not rather read “sampled” instead of “measured”?

12)P.2618,l.24: which depths did the wells cover? Are any estimates of the groundwater depth that is chemically relevant for the stream available? Were there any systematic patterns between groundwater depth and isotopic composition visible?

13)P.2620,l.19/Figure 4: would be more intuitive and clearer to use the same y-axis scale for all 4 panels of that figure

14)P.2620,l.21 and elsewhere: equation numbers?

15)P.2620,l.23 and elsewhere: I would find it more instructive to report the p-value instead of R2.

16)P.2623,l.7-10: I am not quite sure how the authors come to this conclusion. Would we not expect the chemical/isotopic signature of saturation excess water being close to that of groundwater as saturation excess occurs frequently mainly through a rising groundwater table rather than by direct precipitation on the riparian zone itself. Experimental evidence include the observation that wetland surface water can be rather old (e.g. Birkel et al., 2010 (?or maybe 2011?)). I am thus not sure if this statement can be substantiated here.

17)P.2624,l.10-15: linked to the previous comment. Not sure why the authors are so defensive about this observation. I also do not see the need for a mixing line between rain and soil water. I would rather interpret these observations as the importance of essentially “upwelling” ground water in the riparian zone. Thus I can imagine that what we see here is groundwater that re-emerges in the riparian zone (or at least that comes closer to the surface) and while traveling further towards the stream experiences further evaporation/ fractionation, thereby explaining the low slope of the EWL in the stream.

18)P2624,l.22: what is meant by “rain fed wetland”?

References:

Aubert, A. H., Gascuel-Odoux, C., Gruau, G., Akkal, N., Faucheux, M., Fauvel, Y., ... & Mérot, P. (2013). Solute transport dynamics in small, shallow groundwater-dominated agricultural catchments: insights from a high-frequency, multisolute 10yr-long monitoring study. Hydrol. Earth Syst. Sci., 17(4).

Birkel, C., Tetzlaff, D., Dunn, S.M. and Soulsby, C. (2010), Towards simple dynamic process conceptualization in rainfall runoff models using multi-criteria calibration and tracers in temperate, upland catchments, Hydrol. Proc., 24, 260-275.

Heidbüchel, I., Troch, P. A., & Lyon, S. W. (2013). Separating physical and meteorological controls of variable transit times in zeroâĂŘorder catchments. Water Resources Research, 49(11), 7644-7657.

Hrachowitz, M., Bohte, R., Mul, M.L., Bogaard, T.A., Savenije, H.H.G. and Uhlenbrook, S. (2011), On the value of combined event runoff and tracer analysis to improve understanding of catchment functioning in a data-scarce semi-arid area, Hydrol. Earth Syst. Sci., 15, 2007-2024.

Hrachowitz, M., Savenije, H., Bogaard, T.A., Tetzlaff, D. and Soulsby, C. (2013), What can flux tracking teach us about water age distribution patterns and their temporal dynamics?, Hydrol. Earth Syst. Sci., 17, 533-564.

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