

Interactive comment on “Stable isotope investigation of groundwater recharge in the Carpathian Mountains, East-Central Europe” by Carmen-Andreea Bădăluță et al.

Anonymous Referee #3

Received and published: 29 March 2018

It is a pity, but there are basic problems with this manuscript, therefore I can't recommend its publication in this state.

1. According to the title the main focus of the manuscript (MS) is the study of the groundwater recharge. The authors took samples from dug wells for characterizing the shallowest groundwater, but the sampling method they applied was not appropriate. They simply took grab samples 30-50 cm below the surface of the water in the dug wells. Water in a dug well is in direct contact with the atmosphere, and so it may evaporate easily, which modifies both chemistry and isotopic characteristics. Looking at the groundwater data on Figure 3 we can easily recognize that several water samples suf-

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ferred evaporation effect (they are far below the Local Meteoric Water Lines). Actually the slope of the trend line of groundwater samples has got the lowest value, which is another indication for evaporation effect. This entire means that the collected groundwater samples are not representative of the shallowest groundwater. The proper way of taking representative sample of groundwater from dug well involves the removal all the water from the well and the newly infiltrated water can be used for sampling.

2. If we want to determine whether the shallowest groundwater is locally infiltrated or it was infiltrated at a higher elevation area, minimum we need a conceptual groundwater flow model. This is completely missing from the manuscript. Having been identified the local recharge areas we can characterize the isotopic composition of the locally infiltrated water. On the local, intermediate or regional discharge areas the locally infiltrated water necessarily mixes with the discharging groundwater. Once we know the characteristics of the locally infiltrated water, we can study this mixing process.

3. Major part of the manuscript deals with precipitation including its isotopic characteristics. But: stable isotope time series are discontinuous for both stations, Rarău and Suceava, see Table 1. In case of Rarău there are long periods with no data, e.g. from December 2012 to April 2013, or from June 2014 to December 2014, or from September 2015 to May 2016. The situation for the Suceava station is far better, but there are several months (actually 10) without any data. I hardly believe that there was no precipitation for so long periods of time (the MS doesn't mention any reason for lack of data). This entire means that the precipitation isotope data theoretically don't describe well the local precipitation. This data set can be used for calculating the first approximation of the LMWLs, but inadequate for calculating the multiannual means of delta values.

4. Not having representative groundwater samples, neither proper mean delta values of local precipitation the "Stable isotope investigation of groundwater recharge" is hopeless, or at least inappropriate.

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5. HYSPLIT: I am not experienced in this field, so I have discussed this part with two of my colleagues, who are applying this method in their research work. They have confirmed my feeling that modelling at only one level (500mb) is not enough. Modelling at three levels is the most common situation in these kinds of publications (recently). Furthermore, the specific humidity along the trajectory was not determined, so the source region of the air mass was determined, but not the source region of the vapor!

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-6>, 2018.

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