Review on manuscript hess-2023-230

Title: Altitudinal Control of Isotopic Composition and Application in Understanding Hydrologic Processes in the mid Merced River Catchment, Sierra Nevada, California, USA

Author(s): Fengjing Liu et al.

General comments:

In the manuscript by Liu et al. the authors aimed at quantifying how changes in the snow-rain proportion affect stream flow and groundwater recharge in a snowmelt-fed river system. Study site was the mid Merced River catchment, representative for the central and southern Sierra Nevada.
In extensive field campaigns hydrologic and meteorological data of precipitation, snow depths, daily mean discharge were collected, as well as water samples from the main (Merced) River and tributaries, springs, groundwater, snowpits, and glacier melt. Isotope data were available from stream water, groundwater, and springs weekly to biweekly (to monthly) from 2005-2008.
With their comprehensive study they try to better understand the processes or factors that control the spatiotemporal variability of isotopic composition in precipitation, stream water, and groundwater and how such information could be used to advance the understanding of hydrometeorologic and hydrologic processes. The manuscript is very well structured and nicely written. The topic fits well to the scope of the journal and appears to be of interest in the catchment hydrology and alpine hydrology community.

Based on the hydrologic and meteorological data they could show that less snow and earlier snowmelt lead to a shift in peak river runoff toward late winter and early spring, away from summer when water demand is highest. Based on the isotope data, they implemented a catchment characteristic isotopic value (CCIV) in order to elucidate hydrometeorologic processes over seasons – an interesting approach which seems to be quite appropriate for snowmelt-fed catchments.

However, changes or systematic shifts in the snow-rain transition zone due to climate change couldn't really be proved since the observation period was too short and further, during their 3-year observation period they stated that one of the years was very wet and one very dry. Therefore, only relying upon the data from these extreme years seems to be questionable or it might at least be difficult to draw reliable conclusions, especially long-term conclusions on climate change. It would thus be great to continue the time series in the future.

Specific Comments:

P7, Table 1: D-Ex data are missing – perhaps due to temperature issues for d18-O during isotope analysis with the DLT-100?

P9, l. 196 please insert standard deviation after 1σ - in order to define this acronym in the first instance

P9, l. 246 DEM - define this acronym in the first instance

P9, l. 255 WY - define this acronym in the first instance

P16, l. 389 LMWL - be careful when establishing a LMWL based on snow samples because of isotopic fractionation.

P28, Figure 10b and text p. 29 l. 683ff: I'm not sure that evaporation in Yosemite is much stronger… True, it plotted further right but the slope seems to be steeper than for Tenaya.