

***Interactive comment on* “Hydrological and Runoff Formation Processes Based on Isotope Tracing During Ablation Period in the Third Polar Region” by Zong-Jie Li et al.**

Anonymous Referee #3

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This manuscript presented interesting work on detecting hydrological processes via stable isotope technique conducted in the source area of the Yellow River, where undergoing permafrost degradation caused by climate changes. However, some major issues with the isotope data interpretation, the basis of hydrograph separation and the model calculations, which brought in large uncertainties. Meanwhile, in the discussion section, especially in 4.3, the authors seemed to simply put on existed references or just to repeat reporting similar opinions and reviews from previous studies to support their results, which resulted in the lack of novelty and scientific significances. How the data and results presented in this manuscript can defend for the permafrost hydrology. Besides, there was no discussions on the glacier melting.

Overall, I feel sorry to say that the current quality of this manuscript cannot reach the requirement to be published in HESS, as it did not clearly focus on the “Hydrological and Runoff Formation Processes”, nor solve the evolution mechanism of regional runoff involved with climate changes, permafrost degradation, glacier hydrology. I hope the authors can rewrite their manuscript, not only to improve the writing skills and English expressions, but also to significantly contribute to new hydrological insights.

Major concerns: 1. There is no clear $\delta^2\text{H}$ - $\delta^{18}\text{O}$ space to show the isotopic differences between precipitation, runoff water, permafrost meltwater, glacial meltwater as well as no description on the isotopically comparisons.

2. The EMMA was based on $\delta^{18}\text{O}$ and $\delta\text{d-excess}$, however, $\delta\text{d-excess} = \delta^2\text{H} - 8\delta^{18}\text{O}$, the second tracer was partially relied on the first tracer. According to the basic principles of hydrograph separation (J. Klaus, J.J. McDonnell; Hydrograph Separation Using Stable Isotopes: Review and Evaluation, Journal of Hydrology), using $\delta^{18}\text{O}$ and $\delta\text{d-excess}$ to do three-sources hydrograph was very weak to achieve reliable results.

3. The authors seemed to use single average isotopic content to represent each source (precipitation, permafrost, glacier). However, to estimate the proportions of each component in areas influenced by different permafrost/glacier degradations without considering the spatial and temporal heterogeneity of isotopes as well as evaporation effects along the water flow (changing isotope values) in such extensive watershed might cause great uncertainties.

4. The uncertainties should be addressed. Many factors instead of the only measurement error.

Minor comments: Too many grammatical and word errors, as well as mistakes in graphs and captions. Authors should check their manuscript very carefully and ask for some native speaker to edit to make paper readable before submission.

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