

## ***Interactive comment on “Comparing Bayesian and traditional end-member mixing approaches for hydrograph separation in a glacierized basin” by Zhihua He et al.***

### **Anonymous Referee #3**

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General comments: The study of He and his co-authors presents novel insights into tracer-based hydrograph separation using a comparative approach of evaluating traditional against Bayesian EMMA. In this context, the study aims at filling this important research gap in tracer hydrology both from a methodological and process-oriented point of view. The study shows that the Bayesian approach estimates smaller uncertainties and is less sensitive to sampling uncertainties. The study approach also accounts for isotope fractionation, when using EMMA. Beside only minor comments, I think that the study is mature and presents a concise story line to the readership. The references are with up-to-date and a good use of English can be attributed. After revision of few comments, I can recommend this manuscript for further acceptance in this journal.

Specific comments: Page 6, Line 153: Please use the PALMEX reference (see below)  
 Page 6, Line 175: Please clarify if the measurement precision is the same for both LGR and Picarro instruments, otherwise add this details. Page 6, Line 178: How did you define 'obvious evaporation'? Did you use a deuterium excess threshold? Please insert further details here. Please add also at which EC limit you discarded samples.  
 Page 6, Line 181: Please correct to 'cold season'. Page 8, Line 225: Eqs. 1 -5 hold for 3-components and 2-tracer mixing models. Please provide further information on how you inferred 4 components using 3 tracers. Page 10, Line 293 – 295: Why did you not analyse the snowmelt uncertainty in the snowmelt period? Besides, the sentence is not clear to me: snowmelt is indeed more difficult to sample in the glacier melt season but easier to sample in the snowmelt period. Also its spatio-temporal variability is much higher in that period of time when most of the melting occurs. Page 11, Line 308: Please provide more information on the fractionation effect and how you represented it in your analysis. Page 11, Line 319: It seems that this sentence contradicts with the one in line 326-328. How can glacier melt have high EC if it has low interaction with mineralized surfaces? Please rephrase both parts accordingly. Page 14, Line 379 – 399: This sentence should be moved to the discussion part. Page 15, Line 438: 'In average' Page 16, Line 469: Please clarify. How can samples taken occasionally lead to sharp changes of the isotopic composition? Moreover, randomly taken samples may be part of a strategy to represent tracer variability.

References to add: Gröning, Manfred & Lutz, H.O. & Roller-Lutz, Z. & Kralik, Martin & Gourcy, L. & Pölsenstein, L.. (2012). A simple rain collector preventing water re-evaporation dedicated for  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  analysis of cumulative precipitation samples. *Journal of Hydrology*. s 448–449. 195–200. 10.1016/j.jhydrol.2012.04.041.

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Discussion paper

