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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Large-scale atmospheric circulation control on stable water isotopes in precipitation over the northwestern and southeastern Tibetan Plateau" *by* Xiaoxin Yang et al.

Anonymous Referee #1

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General Comments: The authors present a seven-year observation dataset of isotope ratio in precipitation at Tibetan Plateau and the potential impact of ENSO and NAM on them. It is important to understand what controls the climate in Tibetan Plateau, in the context of both paleoclimate reconstruction and future prediction. Therefor the dataset presented in this study is highly valuable for the validation of GCMs, not to mention its analysis. However, the seven-year is too short to see the impact of ENSO or NAM as the authors admitted in the manuscript. Even if their claim with relatively short data is true, the reasoning to reach the conclusion seems to contain a lot of jumps. Therefor it is difficult to accept this article as it is. The authors need to fix the following issues for

the publication.

1. As the authors mentioned, the seven-year dataset is too short to analyze the impact of ENSO or NAM. Due to that, the signal in Fig.7 is very vague. Please consider to use another dataset (e.g. GNIP and TNIP). Given the performance of the isotope enabled GCMs over the region, using output of the models would be another option. Those models cover more than or close to 30 years. 2. The way to find what controls δ18Op using GCM is uncommon (Fig. 6c and 6d). We usually do the correlation analysis within the model world after the model is validated. In this case, the authors should calculate the correlation between modeled δ18Op and modeled δ18O in vapor, evaporation, and so on, unless there is some particular reason. I am also interested in why the authors include δ18O in runoff and soil moisture to the analysis. Do they affect δ18O in precipitation? If not, they should be omitted. 3. Some explanations for the physical mechanism between large-scale circulation and local processes seem to be missed. I could not find the explanation for the relationship between northward propagation of SASM and local evaporation and continental recycling over northwestern TP (L287-289), and weak westerly jet and local processes over northwestern TP during warm ENSO phase (L20-25). I would appreciate that the authors add the explanations or put references for them.

Specific comments: 1. Sect. 4.3 and Table. 2: The composite analysis shows that ENSO and NAM affects the isotope ratio and d-excess in precipitation over northwestern TP and southeastern TP, respectively. However, the result may simply show the seasonality. Thus I suggest that the authors should show the periods correspond to warm/cold ENSO phase, and high/low NAM phase, respectively. 2. Figure 7: It is unclear what Fig. 7 is shown for. Which variable was correlated with monthly anomaly of δ18OP, vertically integrated vapor flux, or divergence? Why δ18Op is in form of anomaly while the other is not? In case flux is used, what can we get from the correlation between isotope ratio and flux? What is the physical mechanism between them? If Fig. 7 shows the correlation between δ18Op and divergence, that is reasonable be-

cause precipitation along a moisture trajectory does affect isotopic composition in the moisture and hence has an impact on δ18OP. However, still what you can say from the figure is that δ18OÂňÂňP is affected by precipitation along the moisture trajectory and you cannot say that it is affected by westerly. Please be more precise. 3. L324-326: Is it obvious that the decreased precipitation results in enriched isotopic composition due to enhanced evaporation? 4. L328-333: Precipitation seems to increase with this explanation. 5. L333-335: I am curious whether drier condition prevails over northwestern TP in high NAM phase than average. 6. L385-386: What do you mean by "overwhelming northwesterly"? Is it shown in any figures? 7. L392-396: What is the physical mechanism behind the relationship between the enhanced water vapor availability and the depleted δ18O?

Technical corrections 1. The notation of "d-excess" is not unified throughout the manuscript (e.g. L199, L201, and L224). 2. L16, 18: As δ18OP is already defined in L14, please use the defined term. 3. L60: A period (.) is missed in the end of the sentence. 4. L105: Please put references. 5. L156: http 6. L207: The body text and the caption for Fig. 5 are inconsistent. According to the body text, Fig. 5 shows the daily correlation. On the other hand, the caption says the figure shows the monthly correlation. 7. L208: Fig. 5. A period (.) among "Fig" and "5" is missed. 8. L226: Fig.5b 9. L250: Fig. 6a 10. L251: Fig. 6b 11. L256: evaporation 12. L327: decreased precipitation and increased evaporation 13. L426: Spell out LWML. The abbreviation has not been defined in the manuscript. 14. L442: enriched δ18OP 15. Figure. 5: Specify what bars and lines denote. Only from the figure, it is not clear which correspond to slope and intercepts. 16. Figure. 7: Put label number for each panel. Besides, it is helpful if the observation sites are shown in the figure. 17. Figure. 8: I recommend the authors to layout panel f-i in the same manner as panel b-e. For instance, panel f should be "ENSO warm".

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