Hydrol. Earth Syst. Sci. Discuss., 12, C1579–C1583, 2015
www.hydrol-earth-syst-sci-discuss.net/12/C1579/2015/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Effects of changes in moisture source and the upstream rainout on stable isotopes in summer precipitation – a case study in Nanjing, East China" *by* Y. Tang et al.

Anonymous Referee #1

Received and published: 18 May 2015

Summary In this paper, the authors document the isotopic variability of monsoonal precipitation at Nanjing, China, and explore the ways in which atmospheric circulation, moisture source and upstream rainout affect this variability. One motivation for this investigation is that oxygen isotopes, particularly those from Chinese speleothems, are used to infer changes in the amount of Asian monsoon rainfall based on the "amount affect." Recent work, including that reviewed here, however, suggests that the amount affect is weak or non-existent in many monsoon regions and thus alternative reasons for isotopic variation in precipitation need to be explored. Here, the authors suggest that the location of convection and changes in moisture source regions are important

factors that impart significant isotopic variability on δ18Oprecip. In particular, the position of the ITCZ and associated convective maxima is considered. Overall, the paper as presented is interesting and high quality. It is well written and I enjoyed reading about the different influences on monsoonal precipitation and its isotopic composition. The methodology appears to be sound and the results are both interesting and significant for the interpretation of paleoclimate records. There are two major comments that I have, however, about the paper as it stands. Below, major comments are addressed first and are followed by more specific comments.

Decision My recommendation to reconsider after major revisions is based on the assessment that a major motivation of the work is to help improve the interpretation of paleoclimate oxygen isotope records, namely speleothems. In order to do this, monsoonal and non-monsoonal precipitation/isotope processes need to be considered. Here, only the monsoonal season is considered. If reframed as an investigation of those factors that affect the isotopic composition of monsoonal precipitation only, then the paper could be accepted with minor revisions.

Major Comments 1. Despite a lengthy introduction that recognizes changes in the proportion of monsoon and non-monsoon precipitation is important in influencing the average isotopic composition of precipitation, the study presented here only addresses those factors that influence monsoonal precipitation. Since the authors acknowledge in their introduction that one reason speleothem δ18O interpretations in terms of monsoonal amount affect are potentially flawed is that precipitation at cave sites is not exclusively monsoonal, a more complete investigation would consider all the factors that contribute to the average annual isotopic composition of precipitation in addition to those factors that influence the isotopic composition of monsoonal precipitation.

2. Related to the above comment, a discussion that addresses the most important factors that control both the average monthly and annual isotopic composition of precipitation would benefit the paper. Indeed, by discussing the controversy surrounding the interpretation of Chinese speleothems in the introduction, the authors set up the

need to address factors that control the annual average isotopic composition of precipitation, which is preserved in speleothem δ18O records. If the goal of the paper is not to help address the interpretation of speleothems, but instead to provide insight in the factors that contribute to monsoon season precipitation, then the introduction should be modified to reflect this. Otherwise, a more complete discussion on the factors that control the monthly and/or annual average isotopic composition of precipitation should be undertaken.

Specific Comments

Line 84: Vuille et al. (2005) is another reference that could be cited as showing that convection in core monsoon moisture source regions and along moisture source pathyways in Asia contributes to the isotopic composition of precipitation.

Lines 95 – 102: Why not also address winter precipitation and isotopic variability since the data are available? It seems logical to do this since the set up for the paper was with respect to the interpretation of isotopic records that reflect annual averages.

Line 126: The authors here refer to BOB as the Bay of Bombay when in the rest of the paper it appears that the Bay of Bengal is being referred to as BOB (Line 156). Please clarify. Also, is it necessary to abbreviate to BOB in the first place. It's not clear that this and some other abbreviations are necessary. Eliminating some would help the manuscript's readability.

Line 220 – 221: Add a reference for this sentence.

Line 224: Clarify "local water." I presume local surface waters like lakes and streams are being referred to?

Line 229: Delete "Results are shown in Fig. 4." and add (Fig. 4) at the end of the previous sentence.

Line 232: Change "evaporation ratio" to evaporation/precipitation ratio.

Lines 233 – 235: Satements in these sentences are interpretation and should be moved to the discussion. Also, it might be worth adding that the amount affect can still play an important role, particularly during times in the past when precipitation was greatly increase or decreased under different climatic boundary conditions.

Line 248: A brief discussion framing why the ITCZ is being considered specifically and its role in monsoonal climatology would benefit the introduction to the discussion.

Line 257: I don't believe that the method used to calculate the vertically integrated mean water vapor transport was described in the methods.

Line 259 – 264: It is difficult to distinguish the terrestrial boundary in this figure. White lines on top of the contoured meteorological data could help visually. Also rows should be titled with the year each represents and columns should be labeled with the stages that each represents. This will help guide the reader. A more prominent marking of the study site would also be helpful.

Line 283: Use of BOB and SCS doesn't help the flow of the sentence. I might suggest not using these acronyms.

Line 282 – 284: Suggested change: "...convection in the Bay of Bengal and South China Sea (Fig. 5a, f, k), and the delivery of moisture from both regions (Fig. 6a, f, k).

Line 290: The decreased precipitation referred to here is difficult to see as significant in Fig. 6. Perhaps quantify the

Line 298: It is also difficult to see the ITCZ intensity change described here in Fig. 5.

Line 270 – 275: Like Fig. 5, but more so, it is very difficult to distinguish where the terrestrial boundaries are located and as a result it is hard for the reader to easily follow the discussion that refers to this this figure. White lines for terrestrial boundaries would help. Headers for rows and columns, like suggested for Fig. 5, would be good to add.

Lines 335 – 345: Why were the time periods preceding each stage chosen? Is it simply that these periods showed the highest statistical correlations? It would be good to clarify this.

Line 378: δ18O remains enriched despite elevated precipitation?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 3919, 2015.