

## ***Interactive comment on “What controls the stable isotope composition of precipitation in the Asian monsoon region?” by Le Duy Nguyen et al.***

### **Anonymous Referee #2**

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In this paper, the authors used their new weekly precipitation isotope dataset in Vietnam’s Mekong river delta region for 1.5 years, and they tried to reveal the controls of the temporal variation of the precipitation isotope ratio. To do so, they conducted some statistical analyses, and they concluded that the isotope ratio is controlled by mainly regional scale phenomena (mainly by the previous rainfall activity along the trajectory of air mass) especially during the early rainy season, and the contribution of the control varies by season.

In my opinion, even though they conducted multiple methods, nothing is quite new. The control of precipitation isotope had been discussed by many researchers as the authors mentioned, and the authors’ findings were already pointed out by many, too. For example, the quantification of the controls was attempted by several model studies including

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Yoshimura et al., 2003; Risi et al., 2008; Kurita et al., 2011; Ishizaki et al., 2012; etc. Some of these studies do not necessarily focus only Asian monsoon regions, but basically, they tried to reveal more general controls. In these studies, they used GCM or equivalent models to reveal the controls, whereas the present paper used statistical models. Furthermore, by the recent efforts, researchers already began to realize that it is indeed not appropriate to make a simple relationship between precipitation isotopes and climate parameters. The present paper's conclusion of necessity of consideration of multiple climate impacts and temporal (and spatial) dependency on the controls have been explicitly or implicitly stated many times. Therefore, nowadays, more advanced techniques of utilization of isotopic information have been utilized. One of them is data assimilation.

From the above aspect, I have to tell that this paper's methods (multiple regression and trajectory analysis) is no longer insufficient to fulfill the objectives of this study. What I mean is, there is no guarantee that this study's number of 70% regional control can be applied to any other year's temporal variation of precipitation isotopes. In this regard, 1.5-yr long data is not sufficient, too.

Major issue: 1. Drop unnecessary and unrelated analyses. Especially the parts with local meteoric line is not directly related to the conclusion of the study. It is too simple analysis. Even global meteoric line is just conceptual idea (slope of 8 and intercept of 10 is not certain). There maybe some physical reason to have smaller slope, especially by kinetic effect, but in this study, it is out discussed enough. It's better to drop the part.

2. One point data cannot represent Asian monsoon. Perhaps Mekong river delta data had some similarity with Bangkok, but with only 1.5-yr long data, the authors cannot reject possibility of "by chance". Furthermore, such similarity is nothing related to that Mekong data represent all Asian monsoon region. The title is quite misleading.

3. Organize the previous literature with focused temporal and spatial scales. The authors listed many previous studies, which partly investigated on precipitation isotope

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controls, and (implicitly) stated that there is still huge discussion on the controls. However, it is misleading and not true. What is confusing is the controls can be different dependent on temporal and spatial scales. For example, daily variation of precipitation isotopes in some parts of the world is quite likely determined by synoptic-scale moisture circulation, in which previous rainfall activity along the trajectory matters a lot, rather than local precipitation or temperature, and nowadays there is consensus on this in the research community. However, even in the same place, the controls of monthly or interannual time series can be different. It is simply because those smaller scale impact can be offset each other in those scales, so that local signal only remains.

4. Limitation of statistical approach with such short-term data. The conclusion of the study is based on the statistical regression using all samples. The authors should validate their statistical model(s) with different independent samples. In this regard, the observation data is perhaps too short.

5. Most importantly, what is new in this study? As I wrote above, it is well known that precipitation isotope is not controlled by a single factor and the relationship can be different in time and space. The finding in this paper is nothing more than these.

Minor issues:

P2L17: what is “circulation effect”? Describe.

P2L23: what is difference between “distillation during vapor transport” and “upstream rainout”. Aren't they essentially the same?

P2L22-P3L3: Different temporal scales are mixed.

P3L21: Before the authors' conclusion, there are many studies which state necessity of consideration of multiple parameters.

P3L27: For quantification of the controls, usually researchers try to develop a physical simulator. Any statistical model principally cannot explain the real control.

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P4L20: There are many other definition of dry/wet season. What is the impact?

P5L5: “three methods” are not really regarded as different “method”.

P6L4-L20: drop

P7L18: what is TRATIO?

P7L20: The uncertainty of trajectory analysis is not quantified. Perhaps it is minimized in the suggested framework, but how large is the “minimized” uncertainty and what is its potential consequence?

P8L4: PRESS is essentially the same as root mean square error (RMSE), which is more popular in the community.

P8L5: what is “leave-one-out cross validation”? and what does it mean by “equivalent to” it?

P8L16: what is physical meaning of using “mean values of their combinations”? Combination of 800hPa and 850hPa represent 825hPa level (somehow the precipitation was formed at that level at that time)? In this regard, what is meaning of 800/850/900hPa combination?

P10L4-L27: drop

P11L23-L24: I don't agree with this statement. More evidence is needed.

P14L9: Why was 124th model chosen as best?

P15L2: It is good idea. Why don't you do this trial?

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