A detailed, point-by-point response to the review comments is given below. Each review comment is repeated followed with our action to modify the manuscript. All Page and Line numbers correspond to locations in the revised manuscript.

Comments from Anonymous Referee #1:

The manuscript presents a thorough investigation into the seasonal dynamics of water vapor transport and its influence on precipitation isotopes within the Dongting Lake Basin. The study's findings contribute valuable insights into the complex interactions between atmospheric circulation and the hydrological cycle, particularly in the context of a monsoon-influenced region. The research is well-articulated, and the methodology is robust, providing a solid foundation for the conclusions drawn. The implications of this study for understanding regional climate patterns and their potential impact on water resource management are significant. The manuscript is well-written and engaging, but there are areas where further refinement could enhance its clarity and academic rigor.

Response: We appreciate the positive comments from the reviewer and have revised the manuscript accordingly, the details can be found in the responses to the specific concerns.

Here are some specific comments:

Figs. 3, 5, 7, and 9 feature a red box representing the Dongting Lake Basin that is disproportionately small compared to the scale of Region V in Fig. 11. The scale inconsistency across these figures necessitates a redrawing to ensure clarity and

consistency. The visual presentation of data through figures and tables is crucial. Ensuring that all figures are clear, well-labeled, and effectively supporting the text is essential.

Response: We appreciate the reviewer's constructive comments and have revised the scale of Region V in Figs. 3, 5, 7, and 9, i.e. we enlarged the Region V in Figs. 3, 5, 7, and 9 corresponding to the the scale of Region V in Fig. 11 to ensure clarity and consistency. Besides, we also revised the color of the Region to red corresponding to the endpoint (i.e. the center of the Dongting Lake Basin) in Figs. 3, 5, 7, and 9, please find the revised Fig. 3, 5, 7, 9, and 11 as follows:

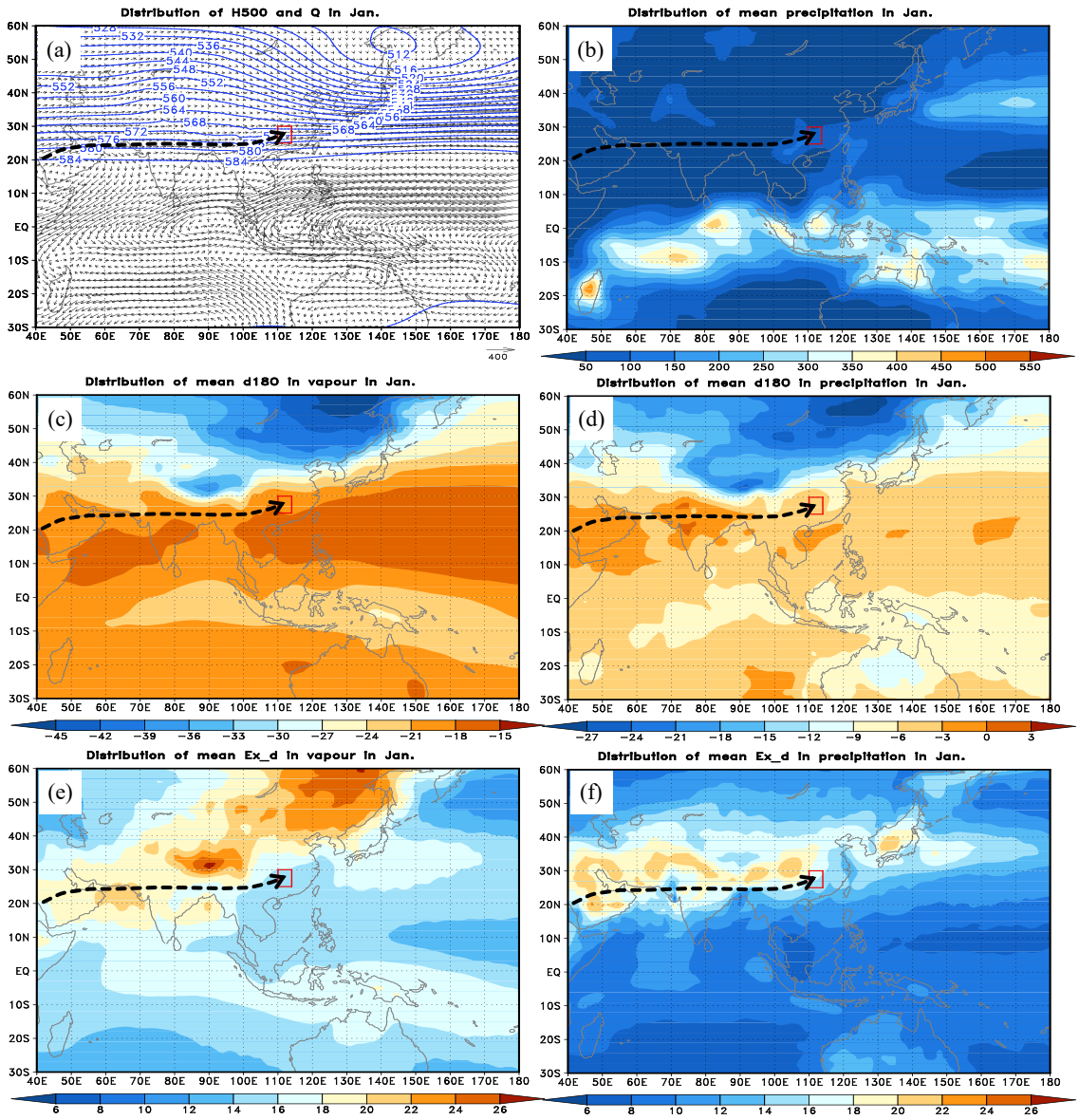

Fig. 3 Mean vapor transport path to the Dongting Lake Basin and the spatial distributions of Q with H_{500} (a), P (b), $\delta^{18}O_v$ (c), $\delta^{18}O_p$ (d), Ex_d_v (e), and Ex_d_p (f) in January. Q, H_{500}, P, $\delta^{18}O_v$, $\delta^{18}O_p$, Ex_d_v, and Ex_d_p represent the vertical integral of water vapor flux, 500 hPa average geopotential height, precipitation amount, $\delta^{18}O$ in atmospheric water vapor and precipitation, and deuterium excess in atmospheric water vapor and precipitation, respectively, hereinafter the same.

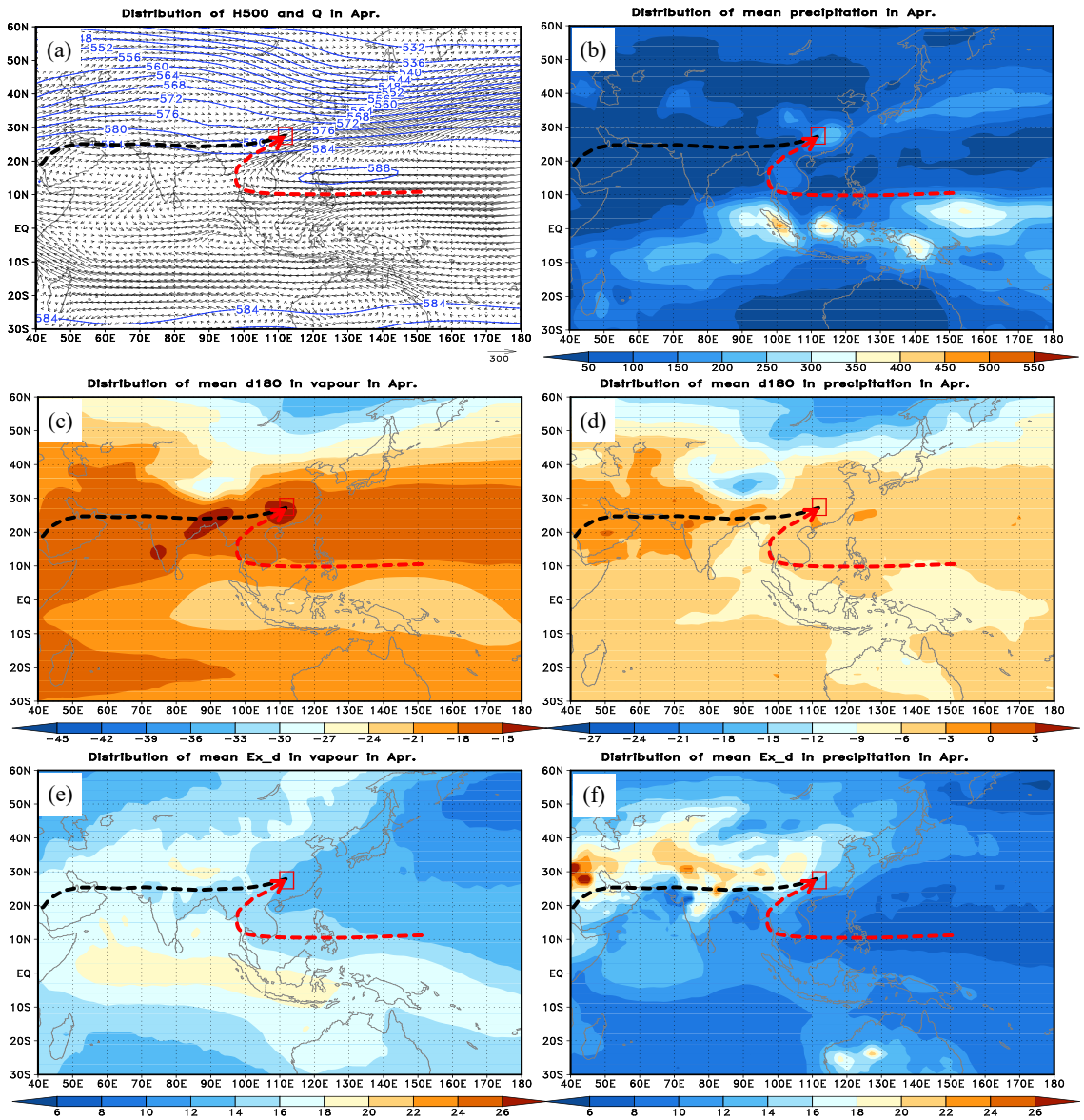

Fig. 5 Mean vapor transport paths to the Dongting Lake Basin and the spatial distributions of Q with H_{500} (a), P (b), $\delta^{18}O_v$ (c), $\delta^{18}O_p$ (d), Ex_d_v (e), and Ex_d_p (f) in April.

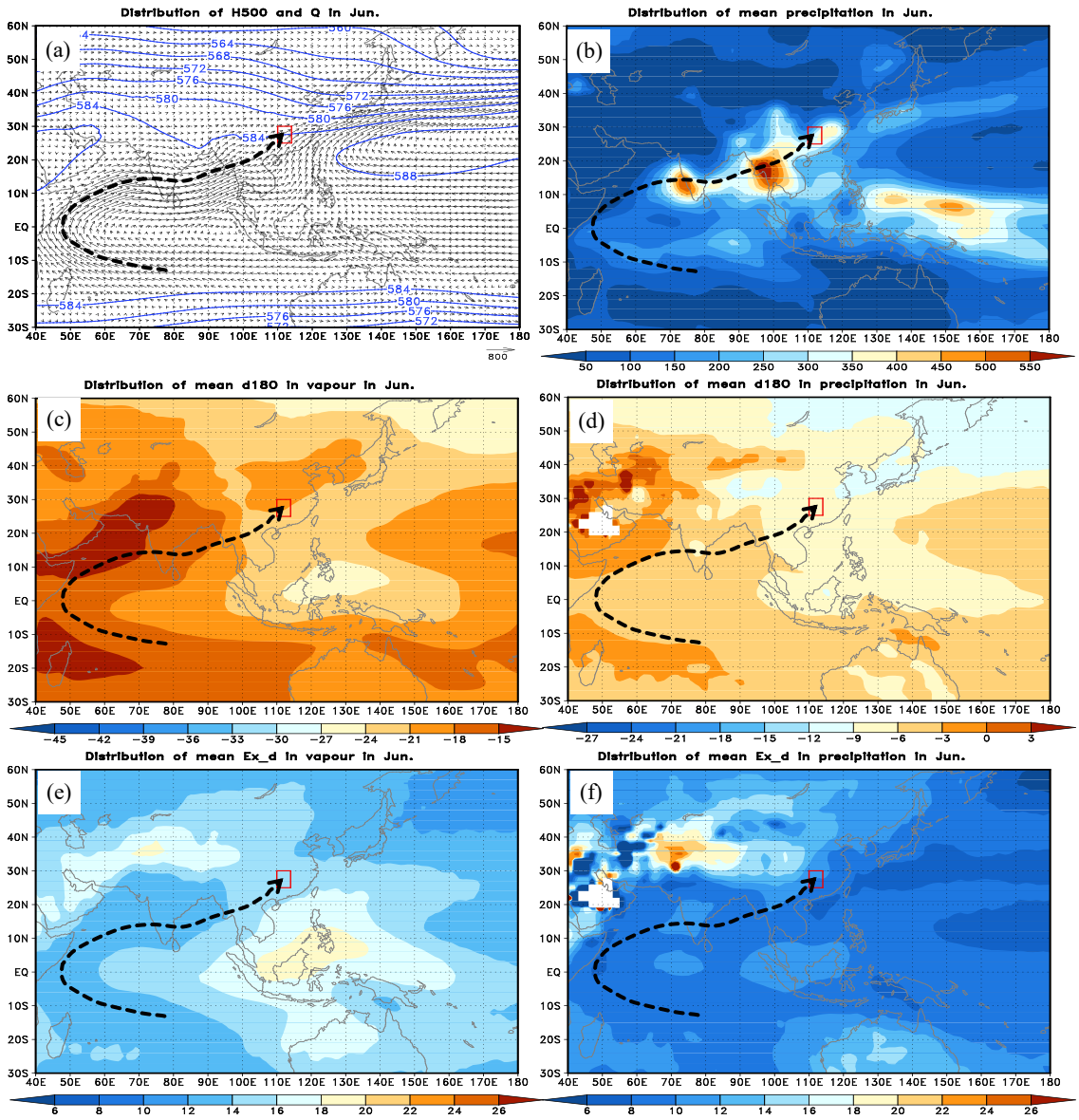

Fig. 7 Mean vapor transport path to the Dongting Lake Basin and the spatial distributions of Q with H_{500} (a), P (b), $\delta^{18}O_v$ (c), $\delta^{18}O_p$ (d), Ex_d_v (e), and Ex_d_p (f) in June.

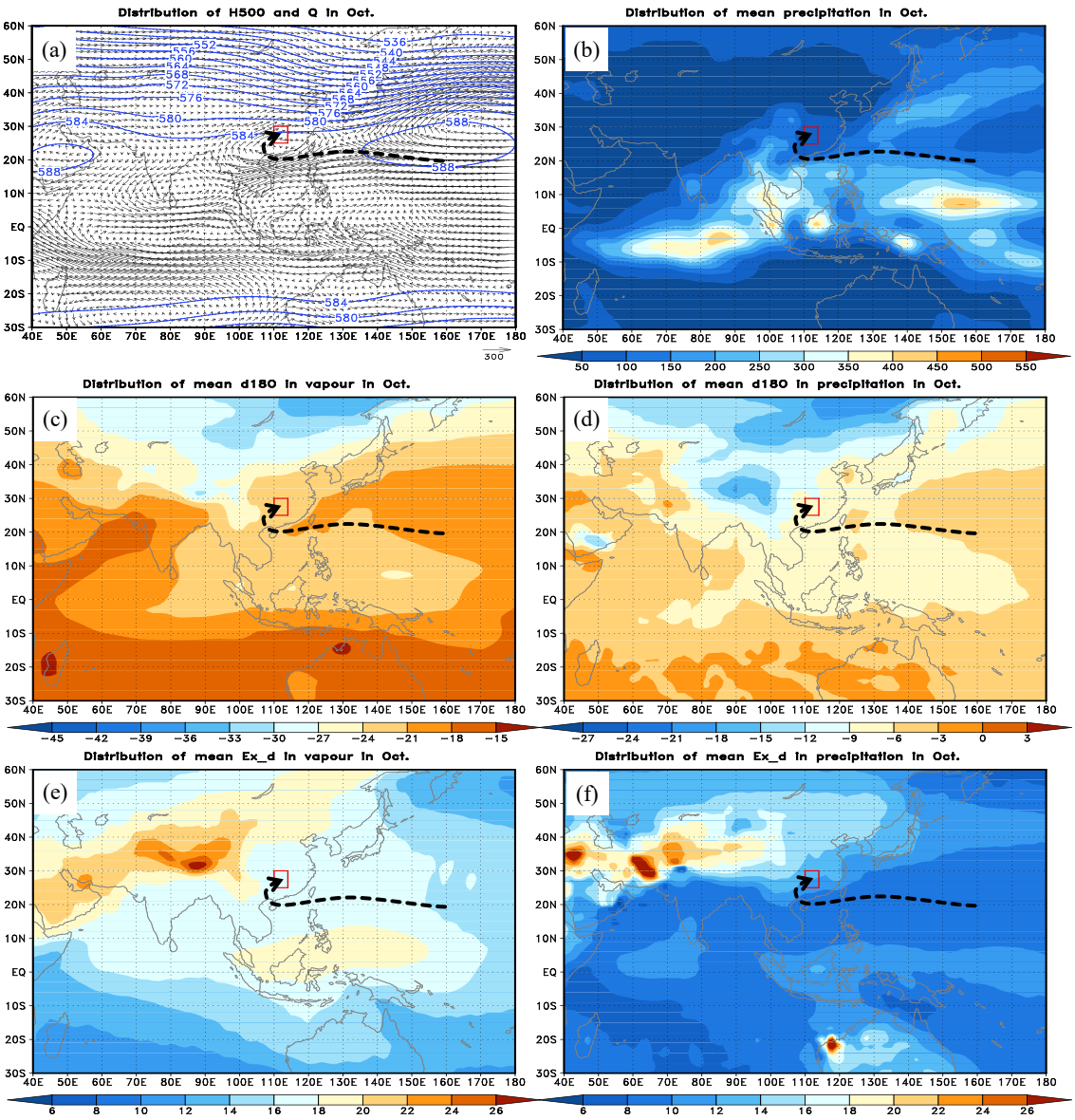

Fig. 9 Mean vapor transport path to the Dongting Lake Basin and the spatial distributions of Q with H_{500} (a), P (b), $\delta^{18}O_v$ (c), $\delta^{18}O_p$ (d), Ex_d_v (e), and Ex_d_p (f) in October.

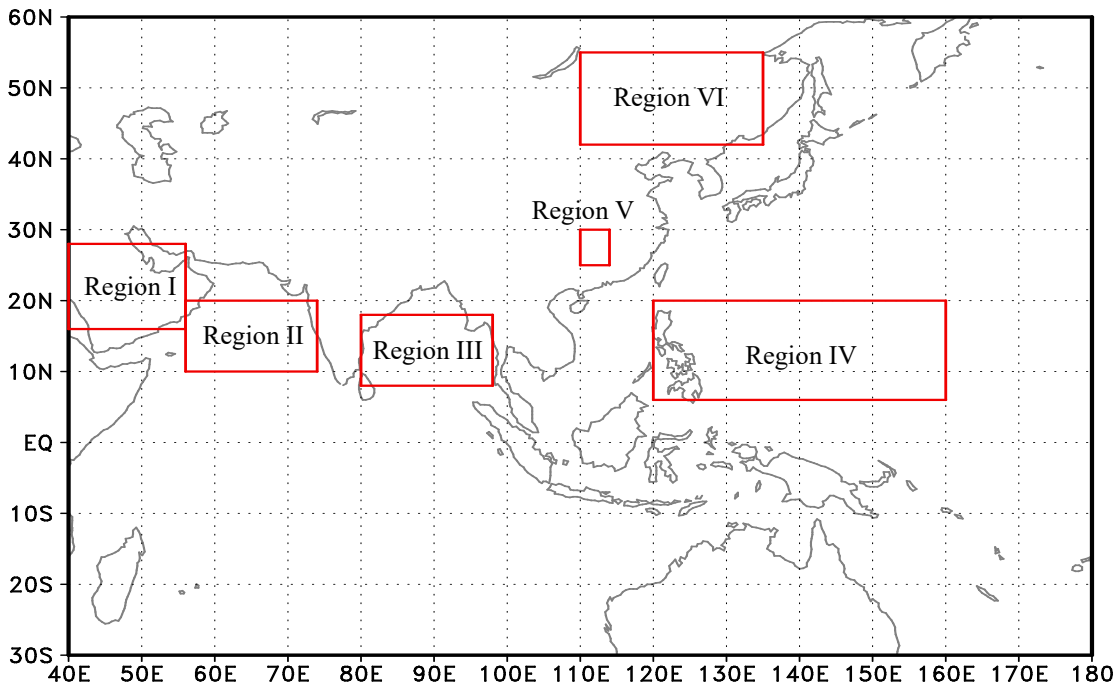

Fig. 11 Geographical distribution of representative regions

(Region I: Arabian Peninsula, Region II: Arabian Sea, Region III: Bay of Bengal, Region IV: Western Pacific, Region V: Dongting Lake Basin, Region VI: Inland of the East Asian monsoon region at middle and high latitudes)

Regarding the figures depicting water vapor transport pathways, what is the representativeness of the factors along these paths? In other words, what are the characteristics of these factors' variations, the features at different grid points, and the attributes during the water vapor transport process?

Response: We appreciate the reviewer's constructive comments and have added the relevant descriptions about the representativeness of the factors along paths and characteristics of the factors' variations: "Moreover, the grid points along the water vapor transport path were identified on the central axis of the path and based on the principle of uniform distribution of the scatter points, and the factors at the grid points

were obtained from these scatter points. Besides, the factors at the grid points along the water vapor transport path exhibit, in spatial terms, as average characteristics of conditions over multiple years, and, in temporal terms, as sequential characteristics of these factors along the water vapor transport path" (Line 402-408).

For the Significance Statement, I believe the narrative logic should be adjusted to align with the main research content and results of the paper.

Response: We appreciate the reviewer's constructive comments and have revised the structure of the Significance Statement: "This research explored how water vapor transports influenced the precipitation isotopes in the Dongting Lake Basin in representative months of different seasons. By tracking water vapor from its source regions, we revealed the influence of large-scale atmospheric circulation on the transportation of water vapor to the Dongting Lake Basin. The changes in water stable isotopes along the water vapor transport paths highlighted the isotopic fractionation and water vapor exchange that occurred along these paths, while the isotopic changes in the precipitation reflect the cumulative influences of water vapor transport on the local precipitation. These comprehensive insights have clarified the influences of atmospheric circulation on water vapor transport and precipitation isotopes, and thus essential for predicting regional precipitation patterns" (Line 33-42).

Figures 3, 5, 7, and 9 did not have labels, the authors need to add "abcdef" to them. Although each figure was annotated within the sb-plots to indicate the corresponding

conference logo, only by making this change can we prevent confusion among readers.

Response: We apologize for the mistake and added the "abcdef" to each of the figures, please find the revised figures above.

Lines 652-666: This section includes numerous comparative statistical values. What is the purpose of these comparisons, and what useful conclusions can be drawn from them?

Response: We appreciate the reviewer's constructive comments and have added the useful insights driven from these numerous comparative statistical values: "These results indicated significant differences in water vapor isotopes between Region VI and other oceanic or continental representative regions, simultaneously, it can be found that oceanic water vapor had varying degrees of impact on the isotopic composition of water vapor and precipitation in Region VI and Region V, both located within the East Asian monsoon region, across different seasons. With emphasis, the numeric comparisons above can also be used to determine whether the major source of water vapor is oceanic or continental, especially based on the judgment of excess deuterium values (i.e. Ex_d_v), because the water vapor coming from the Arabian Peninsula in winter (Fig. 3) had relatively high Ex_d_v values (Table 1, Region I), while the large amount of water vapor coming from the oceanic representative regions in summer (Fig. 7) had very low Ex_d_v values (Table 1, Region III). These different sources of water vapor were ultimately reflected in their impact on the isotopic

composition of precipitation in the Dongting Lake Basin" (Line 677-689).

Lines 175-176: The main cause of the East Asian monsoon should be attributed to the changes in the average atmospheric circulation patterns due to the thermal differences between land and sea.

Response: We appreciate the reviewer's constructive comments and have revised the relevant description to "Its occurrence is closely related to the changes in the average atmospheric circulation patterns due to the thermal differences between land and sea" (Line 175-177).

Lines 178 and 181: The reference should be to the lower layer, that is, the lower troposphere, rather than "near the surface" or "near-surface", correct?

Response: We appreciate the reviewer's comments and have revised "near the surface" or "near-surface" to "at the lower troposphere" (Line 179 and 182).

Line 188: The term "precipitation isotope dynamics" would be better off without "dynamics".

Response: We followed the reviewer's comment and have deleted the "dynamics".

Line 189: It is suggested to change "analysis" to "measurement".

Response: We followed the reviewer's comment and have revised "analysis" to "measurement" (Line 190).

Line 263: This section pertains to the "calculation of the vertical integral of water vapor flux *Q*", not "Model Analysis".

Response: We followed the reviewer's comment and have revised "Model Analysis" to "2.4 Calculation of the Vertical Integral of Water Vapor Flux *Q*" (Line 265).

Line 322: There is no content in this manuscript comparing the "spatial distribution" of simulated and observed data. Is it necessary to include such a comparison? Or, the phrase "spatial distribution" could be directly removed.

Response: We appreciate the reviewer's comments and have deleted the "spatial distribution" for a more accurate expression.

There are minor grammatical errors and awkward phrasings that should be corrected to improve the manuscript's readability:

Line 161: The term used in the text to express "moist and cold" is more accurately described as "wet and cold". Are there any alternative terms that could be used?

Response: We followed the reviewer's comment and have revised "moist and cold" to "wet and cold" (Line 161).

Line 276: The gravitational acceleration "g" should be in italics.

Response: We followed the reviewer's comment and have revised gravitational acceleration "*g*" to italics (Line 278).

Line 304: The term “RA5” should be “ERA5”.

Response: We followed the reviewer’s comment and have revised “RA5” to “ERA5” (Line 305).

Line 411: “The East Asian mid-to-high latitude regions”, please check the accuracy of this expression. I suspect the original intent might have been to say “The mid-to-high latitude regions of East Asia...”. Please ensure that the same terms are used consistently throughout the manuscript to avoid confusion.

Response: We followed the reviewer’s comment and have revised “The East Asian mid-to-high latitude regions” to “The mid-to-high latitude regions of East Asia were still influenced by the winter monsoon” (Line 424-425).

Lines 353, 599, and two other instances: The expressions “regarding the Dongting Lake Basin as the endpoint” and “regarding the Changsha site as the endpoint” should be consistent. Alternatively, use “According to the method introduced in section 3.2.1, ...”.

Response: We appreciate the reviewer’s constructive comments and have revised the “In the *Q* field (Fig. 3a), a vector interpolation method was applied regarding the Changsha site as the endpoint” to “In the *Q* field (Fig. 3a), a vector interpolation method was applied regarding the center of the Dongting Lake Basin as the endpoint” (Line 385-386). Moreover, in the following text, we revised the relevant sentence to

"Two water vapor transport paths were obtained according to the vector interpolation method introduced in Section 3.2.1 (Fig. 5a)" (Line 467-468), "the water vapor transport path was determined in June according to the method introduced in Section 3.2.1 (shown by the black arrow lines in Fig. 7)" (Line 546-548), and "the water vapor transport path was determined in October according to the method introduced in Section 3.2.1 (indicated by the black arrow line in Fig. 9)" (Line 610-612).