First of all, we would like to thank the editor and the reviewer for their time and valuable remarks. Below is our point-by-point response to all the comments made by the reviewer.

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Anonymous Referee #1

General comments

This study describes temporal changes in water vapour transport pathways into the East Asian monsoon region over the last ~50 years. Using NCEP-NCAR reanalysis data, the study provides climatological information about vapour transport changes into the region in the second half of the 20th Century, which has implications for stalagmite oxygen isotopic composition in the region.

The study provides useful information on regional circulation changes that impact vapour transport pathways, which are, in turn, important for archives of past climate change. The analysis of these pathways is comprehensive and convincing and is potentially useful for interpreting palaeoclimatic signals.

However, the findings of the study, stemming from the paper title, are largely overstated. While circulation and sea surface temperature changes are explicitly considered, the study does not look at isotopic changes in any comprehensive way. There are various omissions from the study (detailed below) that need to be considered.

Response: We thank the reviewer for his/her kind encouragements and helpful comments. We totally agree with these comments especially on the paper title and isotopic changes, all “overstatement” and “omissions” have been carefully modified in our revised manuscript. The following responses have been prepared to address all of the comments in a point-by-point fashion.

Specific comments

1. The title of the manuscript needs to be reconsidered. Does “Proof in climatology. . .” make sense? The word “proof” does not seem entirely appropriate. Particularly, can the authors guarantee that the pathways described herein are stable

under past boundary conditions? The paper does not seem to really delve into stalagmite isotopic variability but rather only summarises the ratio of water vapour transports passageways. Given the emphasis in the title and introduction on stalagmite isotopic variability, this needs to be addressed in more depth in the paper.

Response: Mostly agreed. Nobody guarantees that the pathways described in the paper are stable under past boundary conditions. Therefore, we have revised the title as "Checking the ability of Chinese stalagmite $\delta^{18}O$ to record the variation in atmospheric circulation during the second half of the 20th century". In the new title, the period discussed has been restricted, while the sources of water vapor are still addressed linking to the trend of Chinese stalagmite $\delta^{18}O$. Meanwhile, we have given more analysis in depth at appropriate places of the revised version.

2. The isotopic variability from speleothems is not really discussed in the text. The study begins describing speleothem records but these are not discussed in any real detail and only a superficial discussion of isotopic variability and implications is provided. Similarly, any implications for understanding past isotopic variability are not considered, but should be.

Response: Agreed. In the revised manuscript the isotopic variability of speleothems on different time-scale is discussed detailedly and all possible implications for isotopic variability such as temperature, precipitation, circulation are considered.

3. In general, the manuscript is poorly written, it is confusingly structured in the early sections and contains many sentences that are difficult to understand. In particular, the Introduction begins with information on stalagmite records that are not discussed in further detail, the circulation effect is not defined adequately and it is not clear where this study fits into the existing literature. It would be clearer to begin describing the existing literature and then the motivation for the study. Further details of poor sentence structure and grammar are provided in the technical comments below – overall it may be useful for another colleague with proficient English skills to proof read any further drafts of this manuscript.

Response: Accepted. We have rewritten our manuscript with a beginning of describing more existing literatures as the scientific background which arouses our interest of this topic. And we will have our revision checked and proofed by a native English-speaker colleague before submitted.

4. The manuscript does not adequately describe how this study differs from previous work and indeed many relevant previous studies are entirely absent from the references. These include papers such as Wang, 2013 in PNAS and Zhou, 2009 in Journal of Climate.

Response: Agreed. We have described how this study differs from previous work in Introduction and cited more papers including "Wang et al., 2013 in PNAS" and "Zhou et al., 2009 in Journal of Climate".

5. The text contains too many acronyms for the reader to keep track of, so the notation needs rethinking. In particular it is very difficult to keep track of the acronyms that represent the ratios of other acronyms.

Response: Agreed. In the revision we have deleted the ratio of other acronyms (SB, WB and WS) and only reserve those which are necessary and easily remembered.

6. The study does not address any potential biases in NCEP-NCAR reanalysis or look at any other reanalysis products as a complementary lines of investigation. Possible issues with data quality need to be addressed explicitly.

Response: Agreed. To verify the reliability of the results from NCEP-NCAR reanalysis data, we use the ERA-40 reanalysis data to repeat the analysis in the revised version. $R_{SCS/BOB}$, $R_{WNP/BOB}$ and $R_{WNP/SCS}$ from ERA40 have significant correlation coefficients (greater than 0.9) with those from NCEP-NCAR reanalysis. The atmospheric circulations, WVTs and SST associated with $R_{SCS/BOB}$, $R_{WNP/BOB}$ and $R_{WNP/SCS}$ are also consistent with those from the NCEP-NCAR reanalysis. And being more convincing, we only use these data from 1960 to 1994 in order to fit into the isotopic trend analysis.

7. Similarly, there is only superficial description of amount effect and connection to water vapour transport. These concepts need to be integrated more clearly. How does changes in WVT impacts isotopic composition in vapour/precipitation and how does this impact isotopic variability in speleothem calcite?

Response: Agreed. It should be explained how various isotope effects connect to water vapor transport and how the speleothem records these signals. We have done these in the revised version.

8. The abstract is very technical and descriptive and should instead provide a more concise summary of the results of the study and the implications of these for the wider community.

Response: Agreed. We have modified the abstract according to the reviewer's suggestions.

Technical corrections

- Title: The title needs to be reworded as no "proof" was provided of circulation impacts on isotopic variability.

Response: Agreed. We have reworded the title as mentioned above.

- 42654, line 14: This sentence needs changing, specifically ("have supplied chronologic benchmark")

Response: Agreed. We have removed this sentence.

- 4265, line 21: Should be 1950s not 1950's

Response: Agreed, and "1950's" has been replaced with "1950s".

- 4265, line 22 ff: These sites are described here but largely ignored in the rest of the text. What is their purpose? They should be integrated into the analysis better.

Response: Agreed. These sites and related descriptions have been removed.

- 4265, line 27: What does “obviously” mean? Can the data be provided so the reader can see this?

Response: Yes, we can provide the data to explain why there is such kind of difference between these sites and we have done this in the revision.

- 4265, line 27: Reword this sentence (“Precipitation in China, as we have known. . .”) as it is not clear who we is.

Response: Agreed. We have removed these sentences.

- 4266, line 2: Reword “Therefore, amount effect. . .” as this is poorly worded.

Response: Agreed. We have deleted these sentences.

- 4266, line 5: The amount effect should be introduced earlier and defined clearly.

Response: Agreed. We have defined “amount effect” clearly in Introduction of the revision.

- 4266, line 28: Reword the last sentence and please provide a reference for this statement.

Response: Accepted. And the sentence has been revised with a reference added.

- 4267, line 1: It is not clear what “from climatologists” means, reword this.

Response: Accepted. The sentence has been revised as “As a part of monsoon system, the WVT in East Asia is closely connected to atmospheric circulations and monsoon precipitation”.

- 4267, line 15: This paragraph assumes a lot of local knowledge by the reader, can these locations be shown on a map?

Response: Agreed. We have marked the Yangtze River and the Yellow River in Figure 1, which could help readers to understand local knowledge mentioned.

- Section 2 Data and Calculation – What is the calculation of? Also, the potential biases in the reanalysis dataset need to be address. Data quality issues have not been discussed at all.

Response: Agreed. We have replaced "calculation" with "methodology". Meanwhile, we have addressed the potential biases in the reanalysis dataset and subsequently ERA40 reanalysis is used for cross-check.

- 4268, line 11: "The surface pressure is used to treat the impact of topography" needs rephrasing.

Response: Agreed. We have reworded this sentence as "The surface pressure is used to remove the impact of topography".

- Section 3 "ratios" not "rations". Also, I'm not sure about an acronym to describe the ratio of various other ratios, can this not be expressed more simply as "ratio of intensities of WVT passageways"? This is wordier, but easier to understand.

Response: Agreed. We have replaced "rations" with "ratios". Meanwhile, the ratios have been described as $R_{SCS/BOB}$, $R_{WNP/BOB}$ and $R_{WNP/SCS}$, which are easily remembered.

- 4269, line 5 ff. What exactly do you mean by "branch" and how do these correspond to the pathways described in the introduction?

Response: Agreed. The word "branch" is really not clear although they briefly mean a part of WVTs. In the revised version we do maintain consistency in the wording of the article.

- 4269, line 13. Reword this "Because of the guide of . . ." and can the WPSH be shown on a map in the early part of the manuscript?

Response: Agreed. We have reworded this sentence as "The WPSH induces water vapor from the western Pacific to the eastern China". And actually, in Figure 1 the

anti-cyclonic circulation in the western North Pacific has indicated the position of the western Pacific subtropical high (WPSH), what we should do is to add an explanation.

- 3.2 Are these decadal shifts statistically significant?

Response: In the revised manuscript, we have replaced "decadal shift" with "trend". The intensity of WVT from the western North Pacific and vapor source ratios ($R_{WNP/BOB}$ and $R_{WNP/SCS}$) both show the increasing trends during the period of 1960-1994, above 95% confidence level.

- 4270, line 1. What do you mean by "In climatology. . ."?

Response: We have removed these words which may be redundant and ambiguous.

- 4270, line 14. What does "normal" mean here?

Response: Usually, climatologists define a climatic normal as the arithmetic average of a climate element such as temperature over a prescribed 30-year interval (see Wisconsin State Climatology Office at website http://www.aos.wisc.edu/~sco/normals.html). Here "normal" means the arithmetic average of the climate element over the whole period mentioned.

- 4270, line 20 ff. The circulation effect has not been adequately connected to WVT passageways in this study. This needs to be discussed in more detail, possibly when the "circulation effect" is first described.

Response: Agreed. The "circulation effect" should be adequately discussed when it is connected to WVT passageways in this study, and this has been done in the revision.

- 4271, line 5. Can these years be put in a table instead? This would make this section easier to read.

Response: Agreed, and it has been done as table 2.

- 4271, line 16 ff. But are these difference described statistically significant? They

don't seem to be from the colours in Fig 4a.

Response: Agreed and we have deleted the parts on $R_{SCS/BOB}$ in the revised manuscript.

- 4272, line 28. Does this mean that the position of the WPSH is diagnosed from the position of the 5870 gpm contour? Can this be made more explicit?

Response: Yes, the WPSH could be shown with many variables such as geopotential, horizontal winds, etc. As the usual way, 5880 gpm, 5860 gpm as well as 5840 gpm in 500hPa geopotential height are usually selected to show the WPSH. Then this is not crucial because WPSH varies year by year. For example, if it is too weak then 5880 gpm lines cannot be shown, however, 5870 gpm lines can be shown such as in this Fig, so the 5870 gpm is selected here to show the position of the WPSH. These descriptions could make our uses more explicit.

- 4273, line 4. There are multiple influences on stalagmite isotopic variability that have not been acknowledged and should be.

Response: Agreed. We have modified this sentence and objectively analyzed the influences besides where the water vapor comes from.

- Section 5. The first paragraph needs to be reworded, the writing is hard to follow and poorly written.

Response: Agreed. We have totally reworded this paragraph.

- 4273, line 18. What does "previous" mean here?

Response: Figure 8 indicates the correlation maps of summer $R_{WNP/BOB}$ with SST at each grid point during previous autumn (September-October-November), winter (December-January-February), spring (March-April-May) and concurrent summer (June-July-August). The "previous" means that last autumn, winter and this spring are prior to this summer.

- 4275, line 7 “In light of the conception of circulation effect. . .” needs rewording.

Response: Agreed. We have revised this sentence as “On the assumption of circulation effect ……”.

- 4276, line 11 “In light of circulation effect . . ..” The isotopic variability in vapor and stalagmite calcite needs to be discussed more thoroughly in this study, as the WVT and isotopic connection has not been made clearly enough.

Response: Agreed. We have discussed the isotopic variability in vapor and stalagmite calcite, as well as the connection between the WVT and the isotope more thoroughly in the revised version.

- Figure 1. The word “ranges” in the caption seems ambiguous – why does this mean? Also the regions are hard to see above the wind vectors.

Response: Agreed. We have replaced “ranges” with “extents”, and assigned clearer color to the rectangles.

- Figures 8 and 9. The contours are very difficult to pick out and read, these need to be changed so they can be seen.

Response: Agreed. We have redrawn Figs 8 and 9.