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Interactive comment on "The climate reconstruction in Shandong Peninsula, North China during the last millennia based on stalagmite laminae" *by* Q. Wang et al.

Anonymous Referee #2

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This paper presents new lamina thickness and oxygen stable isotope data from the top of a stalagmite collected from Kaiyuan Cave, in northern China. The authors claim that both series are related to the monsoon intensity or amount of summer precipitation and consequently attempt to reconstruct climate variability in the region for the period covering 1217-1892 AD. While is worth publishing this dataset, I think that the manuscript needs substantial revisions before publication.

My major comments:

- The manuscript is difficult to read (there are numerous grammatical errors, awkward expressions and substantial redundancy) and thus I recommend the authors to edit the

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manuscript to help the reader.

- From a scientific point of view, my main concern is that the assumptions considered in the interpretation are supported only by two other studies and it is not clear if these studies present results from the same stalagmite/cave. Thus the assumptions underpinning the conclusions of this study need to be further demonstrated. For instance, the authors mention correlations between monsoon intensity and both lamina thickness and d18O but no correlation coefficients (or their significance) are provided anywhere in the manuscript. This assumption could be strengthened by providing correlation coefficients of present rainfall d18O in the area (if available) and monsoon intensity and/or comparing the presented datasets with other palaeoclimate reconstructions and/or historical data in the region.

- It is not clear to me how the age model has been constructed. The authors mention lamina counting and U-Th dating but it is not clear how they've merged both datasets to construct the final age model. In addition, the uncertainties associated to the age model are largely ignored throughout the manuscript. I would suggest a $\pm$ uncertainty is added after the years mentioned in the study. Along the same lines, confidence intervals need to be included in Figure 3.

- All the references in this manuscript (except of 3) belong to the introductory section. More studies need to be supporting the interpretation of the results.

- I would suggest modifying the title of the manuscript so that it also mentions the oxygen isotope data (instead of only "stalagmite laminae").

Section 2:

- The list of the tree species in the area is irrelevant for this study. Please, omit it.

- In this section, the authors present the geological setting, the meteorology of the area and the U contents of the stalagmite at different depths. I would suggest this section to be merged with section 3 and separate each part in a different subsection. For instance

the last part of section 2 (Lines 5-12 in pate 4648) could be merged with subsection 3.2 (Lines 1-12 in page 4649) to present the U contents and the age-depth model together.

- Please think about presenting a cross section or a map of the cave showing the location of stalagmite Ky1.

- Line 7 page 4648: Please refer to Figure 4 here and update the figure numbers accordingly.

Section 3:

- Please consider presenting first the age-depth model, as the lamina thickness and the oxygen isotope data will rely on the age model to construct the time series presented in Figure 6.

Section 3.1:

- A part from using the three series of lamina counts described in Line 19 (Page 4648) to average them, they could also be used to estimate a confidence interval associated to the lamina counting. Please consider this.

Section 3.2:

Please see my comment above.

Section 3.3:

- What have been the criteria for selecting the samples that would be analysed for oxygen isotopes? Are they equally spaced over time or over the length of the stalagmite? Please clarify. It seems from your Figure 6 that fewer measurements may have been performed for the earlier part of the record. Otherwise, please clarify.

- You mention a total of 330 samples of 5mm width each of them separated to the neighbouring samples by 0.13mm, with a sampling rate of 7-8 samples per mm. From this I understand that there is a considerable overlap between samples: the micromilled

track of each of the samples is 5mm wide and, in these 5mm, so you have taken 5x7-8 samples (35-40 samples) in every millimetre. Then, you've selected 172 samples from these 330. I don't need to know that you retrieved 330 if you only show me the results for 172 of them. Instead, I would rather know the real distance between the presented 172 samples. Do these samples overlap? Again, 172 samples x 5mm width = 860mm. However, the upper part of ky1 stalagmite is only 82mm. Please clarify and avoid irrelevant information that may confuse the reader.

Section 4:

- There are only three references cited in this discussion section. The authors should make a bigger effort to provide the context of their research and compare their results to other data published in the area. In general, are your interpretations consistent with other studies?

Section 4.1:

- Line 17 page 4650: I don't understand what you mean by "benchmark to reckon". Please rephrase.

- Lines 16-25: It is not clear to me what you are using the 25mm data for, if the results you provide as the final time series are those considering only the data from 6mm (see lines 18 and 24). Please clarify this point.

Section 4.2:

- The authors present here results about the structure of selected laminae. However, these results are only vaguely interpreted afterwards. I think the authors should consider if this data provides important information to their study and, if so, develop the idea presented.

- "Because of layer thickness variation may correspond to the climate environment change when layers are developing, show the potential value of these nonopaque layers of stalagmite in rebuilding the paleoclimate environment" in lines 5-7 page 4651.

Please develop. This sentence is not enough to then consider that the laminae thickness variation is a proxy for monsoon intensity.

- Lines 9-13: Awkward sentence. Please rephrase.

- Line 16: Also observed in Figure5a

Section 4.3:

- Line 21 page 4651: Is the "similar symbol (∼)" used to express a range? If so, please use a simple dash and write the lowest value first: "13.03 - 712.8 μm"). Fix throughout the manuscript (e.g. line 18 page 4652).

- I don't understand the criteria followed to select the periods presented here (1471-1548, 1548-1637, 1637-1744 AD). Please explain it. Would it be possible to provide an objective index of variation or fluctuation of the data so that there is a justification to group the years as it is done here? Something like standard deviations calculated with a moving window of, let's say, 50 years could be a good way to select time intervals. Otherwise, the selection seems too subjective to me.

- Line 11 page 4652: What do you mean by "From 1744 to 1892 it was the low value of layer thickness that sustaining 150 years"? There is a clear peak at about 1775 AD and so the layer thicknesses are not continuously low for that period. Similar comment applies to Line 6 page 4652.

Section 4.4:

- Line 18 page 4652 and everywhere else: Why do you give three figures if the error of the d18O measurements is 0.01 permil?

- Same comment above about the meaning of "sustaining" also applies here.

Section 4.5

- Please provide correlation coefficients (and their statistical significance) every time

you mention that two series are correlated.

- Line 15: Is the error of the age model 20 years at any depth? Please clarify.

- Line 16 "we could say that the two synchronise with time variation". The sentence before does not support this interpretation if no statistical measure of this is provided. The correlation between the series presented in Figure 6 does not seem to be very good.

- The authors should consider adding a plot with the hendy test results instead of giving the values within the text. It would be easier for the reader.

- Line 6-8 page 4654: Just a figure does not support the statement given here. Further analysis and comparisons with other data is required.

- Lines 13-12: Was this interpreted with the same data presented here? Please clarify. A short description of the results of the study by Cheng et al. (2009) would help. However, if Cheng's study used different data the authors should provide evidences that this is still the case.

- Line 12 page 4655: By "detention time" do you mean "water transit time"?

Section 5:

This section should be named "Conclusions" instead of "Results".

Here the authors present a summary of the results already mentioned in the previous section. I suggest they comment on the wider implications of their study and why it is important for someone working on the same region.

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Figure 1: The font sizes used in most of the labels and in the legend are too small. Please fix it. Also, avoid lines going through the labels (see "Yellow sea" on the left panel for an example). Please indicate in the caption what "ISM" and "EASM" stand

for. Also mention the meaning of the yellow and green colours in the left panel.

Figure 3: I would suggest changing one of the two y-axis to give information on the "accumulated counted laminae" instead of showing "distance from the top" in both y-axis. Following one of my comments above, please add the uncertainties associated to the age model as well as to the U-Th dates. Is the height of the grey boxes at 6 and 25 mm representative of the errors, the width of the samples taken for U-Th dating or arbitrary? Please clarify by adding some information about it in the figure caption. The word "standard" may be misleading. Please rename.

Figure 4: Is this an image of the upper part of the stalagmite referred to in this study or all of it? This figure needs a scale! The authors could present more information by adding the paths over which the counting has been made as well as the location of the samples analysed for dating or Hendy test.

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