

Re-review of Gao et al. Evidence of elevation-dependent warming from the Chinese Tianshan Mountains.

The manuscript revision by Lu Gao and co-authors has improved significantly based upon the detailed comments of the editor and all reviewers. The authors have done a lot of additional work to incorporate the reviewer's points and this reflects in a more robust article that better explains the methodology and limitations of EDW exploration in the Tianshan mountain range. While I am generally happy with the changes made to the manuscript, a few comments remain, as well as some small minor text changes. With these changes made, I would recommend the manuscript be accepted for publication.

General comments:

- 1) The results section is nicely divided into a regional, altitudinal and sub-domain focus. However, each section is a little too descriptive and the authors should attempt to shorten each section, focusing upon the main features and utilising the tables and figures to explain all of the individual values of warming and significance etc.
- 2) I believe that the figures have improved slightly, though I think small changes could still help the reader to navigate the information more easily. See specific comments on figures below.
- 3) The authors have incorporated information regarding snow following my initial review. I think this is a good additional to the manuscript, though a few small pieces of information are still missing in my opinion. For example, the snow cover rate (or rather fraction) and average(?) depth is provided for the whole CTM for a given month in each year and compared to the mean (all pixel) warming rate for each month? I think the authors could show the elevation of snow cover in those years vs. the EDW without too much additional effort, but adding extra value to the study. I think the authors should in fact add this as an additional (but succinct) results section rather than just in the discussion. Especially as the data are presented earlier in the manuscript.

Specific comments:

L24: “..typical high mountain regions...”

L40, add semi-colon after “characteristics”.

L43: “..Outside of these mountain ranges.”

L45: as L24

L45: add “..BOTH” before “ observations and models”

L50: I think a more recent reference regarding water towers (Immerzeel et al. 2020) would be suitable here. Immerzeel, W. W. *et al.* (2020) ‘Importance and vulnerability of the world’s water towers’, *Nature*, 577(7790), pp. 364–369. doi: 10.1038/s41586-019-1822-y.

L60-65: There are a lot of short sentences that could be merged and improved for flow.

L97: The Immerzeel reference would also be appropriate here.

L99: How do the authors quantify “water resources” here? Is this a water equivalent of ice volume? It is not clear to me and should be revised.

L101: warming at what elevation? A mean of the entire CTM? Perhaps clarify that here.

L115: change “system” to “systematic”

L145: change to “low elevation terrain”

L160: Reference needed here to support the ‘reliability’ of CMA05.

L162: first step? I do not understand what the authors refer to here. Please revise this to clarify.

L167: snow cover rate? The authors describe a snow cover fraction here. This terminology should be ideally used throughout the manuscript. It is not explicit whether this fraction is just for the entire CTM or another area. The authors need to briefly clarify this. As mentioned, I think the authors could better leverage this information, if only simply, in order to show the snow cover fraction by elevation bands. I believe that this would more appropriately indicate the relationship to altitudinally resolved EDW.

L189: but y was just given as variable estimate from equation 2

L203-204: Not clear, please re-write this more clearly. The authors mean that although some pixels did not have significant change, all pixels in CTM were averaged and compared to WCC and LCC?

L231: better to write as “regional warming”

L297: hilltop? The authors refer to Mountain peaks?

L324: not types – metrics or indicators (as previously written)

L326: “terrain” not “terrains”

L335: “for” T_{min}

L358: A reference is required for this statement.

L370: These are very small snow depth values and likely within the uncertainty of the microwave measurements? Perhaps the changes in depth are therefore not significant? This is another example where elevation bands of depth could be more informative than the average for the whole CTM.

L377: the reported value is the significance (p) value, not the “remarkable” correlation value.

L396: How can the authors state a higher accuracy of monthly EDW here? There is no evidence that the monthly values are more accurate, rather that they allow the exploration of sub-seasonal trends that are obscured when averaging over several months/the whole year.

Figures:

The figures have improved a little, though I still find figures 2-4 could be improved. I think that each subplot could have a title that specifies the month, rather than having to look to the caption, especially as the group of months changes for each figure. I think a righthand axes with a shaded area or bar could be used to indicate the percentage of the pixels in each elevation band as a product of the total area (total pixels). As this does not change between each panel, it could also be added to figure 1.

Figure 1 should also be referred to in the text, as it is not currently.

Figures 5-7: I understand the reviewers point regarding the colour bar scaling being different in each figure. However, I think the authors should still consider setting 0°C 10a-1 to yellow in all figures, so the divergent colour scale (blue negative, red positive) is always equal and the intensity of blues and reds can still be compared for different figures, even though the scale limits are different.