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Climate of the Past Discussions

Interactive comment on "Physical processes of cooling and megadrought in 4.2 ka BP event: results from TraCE-21ka simulations" *by* Mi Yan et al.

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Thank you very much for the comments. We have modified the manuscript carefully according to your valuable comments. The point-to-point replies are as follows:

1. Line 193-194, warming over the SH could be related to the orbital change, which induces insolation increases over the SH but decreases over the NH. How to approve this result. I recommend to plot the temperature anomaly spatial distribution induced by orbital forcing.

Reply: Thank you for point out this. The requested figure has been added in the revised

version as Figure S3. The temperature difference between the cold and warm period induced by the orbital forcing is calculated by the average of period 4200 BP-3900 BP minus the average of period 4800 BP-4500 BP.

2. Line 202-203, Over East China, the precipitation anomalies show a wet south dry north pattern. The figure 3b could not support this result, since the signal is too weak to be insignificant.

Reply: Thank you for point out this issue. Yes, it's not so significant. So a statement has been added in the revised version. Lines 215-219.

3. Line 223-224. The subtropical highs and the relative anticyclones in both the SH and NH are strengthened. We only find the strengthened subtropical high over SH while we could not find the strengthened subtropical highs over NH (Figure 5c). Please examine it carefully.

Reply: Thank you for point out this issue. The strengthened subtropical highs can be represented not only by pressure but also by wind field. But yes, the significant pressure changes are different over NH and SH, with most significant at low level over the NH while at high level over the SH. We added a statement to illustrate this phenomenon more carefully. Lines 242-244.

4. Line 235-236. With higher SLP over land and lower SLP over the adjacent ocean (Fig. 5a). We also could not find this character. Please examine it carefully.

Reply: The SLP gets higher over land significantly while lower over ocean not significantly. Yes, additional statements have added in the revised version. Lines 258-260.

5. Line 244-245. The land over the SH experiences cool but wet conditions, and the mid latitude SH ocean is warmer. Is there proxy-based evidence over SH?

Reply: Unfortunately, we don't have significant evidences right now. But we can tell from the southward shift of the ITCZ position, which tends to locate over the warmer hemisphere.

6. Figure 6. Please clarify the spatial domain of the EOF.

Reply: The region for the EOF is (70W-40E, 25N-80N), which has been added in the figure caption of Fig. 6.

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