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Interactive comment on "Response of *Pinus sylvestris* var. *mongolica* to water change and the reconstruction of drought history for the past 260 years in northeast China" *by* Liangjun Zhu et al.

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Comments and Response:

Anonymous Referee #1

This manuscript presented 260-year PDSI reconstruction based on tree-ring record in the central Daxing'an Mountains, NE China. It is a necessary supplement of past climate proxy records in this area, especially for the annual drought reconstruction and its implication for different drought patterns in recent at the Daxing'an Mountains and Mongolian Plateaus (mild drier), NE Asia. Overall this manuscript is well-written, the

work seems to be of high quality and is appropriate for Climate of the Past. Therefore, I would recommend this manuscript for publication in this Journal after the following issues are addressed.

C1. The manuscript will benefit from a last check by a native speaker. However, readability will improve quite a lot following the careful language check done by reviewer 2.

Response: we agree. The MS will be revised by the native English speaker. We will go through the MS and make sure the language suitable for publish.

C2. The study shows the drought history of Daxing'an Mountains associated with the Pacific and Atlantic Ocean oscillations, while in the discussion section you linked both PDO and AMO to the Asia Monsoon. Is the PDO or AMO modifying the Asia Monsoon or the Asia Monsoon modifying the PDO? Please check it.

Response: we accepted. We have double check the describe. We make sure the PDO or AMO could modify the Asia Monsoon (Ma et al., 2007; Cook et al., 2010; Li et al., 2015; Linderholm et al., 2011; Sun et al., 2008; Chen et al., 2015; Bao et al., 2015).

C3. In discussion section, the author thinks both the PDO and AMO have potential to drive or affect the Asian monsoon, which could affect the drought of NE China. Could you give some evidence to prove the Asia Monsoon influence the drought. It's better for you to give some evidence of climate dynamics to prove the mechanism.

Response: we accepted. We have added the composite anomaly maps of the 200-hPa vector wind and geopotential height, and the SSTs (from January to December) for the 10 wettest and 10 driest years for the Dai-PDSI reconstruction during the period 1948–2010. Some new explanations (following) of climate dynamics were added in discussion section.

Previous studies have found the drought variation of northeast Asia may be teleconnected with the activity of the Asian monsoon (Cook et al., 2010;Li et al., 2015;Linderholm et al., 2011;Sun et al., 2008;Chen et al., 2015;Bao et al., 2015). During the wet years, the strengthened southerlies and easterlies entered China inland associated with a positive pattern over northeast Asia and some negative height-anomaly centers in west Russia and south Asia as well as the Indian and north Pacific oceans, which strengthened the westerly circulation (Fig. 10a, c). For the dry-year composite, however, strengthened southerlies and south-westerlies entered northeast China associated with a positive pattern over east Asia and western Russia, and some negative height-anomaly centers in southern Russia and south Asia as well as the Indian and south Pacific oceans (Fig. 10a, c).

The composite of 200-hPa geopotential height over the Central-North Daxing'an Mountains during the wettest 10 years (positive anomaly) is the reverse of the driest 10 years (negative anomaly) (Fig. 1c, d). Positive and negative SST anomalies were found in the western and northern Pacific Ocean during the wettest and driest years (Fig. 1e, f). During the wet years, relatively abundant moisture is brought from the Pacific Ocean by the strong east Asian monsoon (southeasterly moisture flux), and traveled further northward to Mongolian Plateaus, and then joined with a strong Westerly circulation that causing increased moisture over the Daxing'an Mountains (Fig. 1a). This negative anomaly combined with positive SST in the western and northern Pacific Ocean leads to an enhanced dry jet (south-westerlies) across/toward the Daxing'an Mountains (Fig. 1b, c, e). Similar finding that drought variations over northeast Asia are strongly linked with the Asian monsoon and SSTs in the Pacific and Atlantic oceans were also found by (Cook et al., 2010;Li et al., 2015;Linderholm et al., 2011;Chen et al., 2015;Bao et al., 2015) . Besides, the abnormally low potential evaporation pattern in Daxing'an Mountains during the wettest years supports such a connection or pattern (Fig. 2). Therefore, dry-wet conditions in Daxing'an Mountains are linked with SSTs in the Pacific and Atlantic oceans and Asian monsoon intensity.

C4. From the abstract and conclusion, the readers may feel this tree-ring-based PDSI reconstruction is about the whole region of Daxing'an Mountains, NE China. In fact,

it's just a single site PDSI reconstruction. I suggest authors revise it, and specific the study area. For example, just use the central Daxing'an Mountains.

Response: we accepted. We have revised it.

C5. In figure 9a, the low frequency MADA series looks not match with its high frequency series. Please check it.

Response: we have double check the data. We make sure that it's right.

C6. It's hard to see the reconstruction point (red) in figure 6, please use different color.

Response: we accepted. We have changed the figure.

C7. Seven tables and twelve figures in your MS, it's too many, some of them could be put in the supplementary materials but in the text.

Response: we accepted. We have moved some figures (figure 3, 8 and 11) and tables (Table 2) to the supplementary materials. Now only six tables and ten figures is left.

C8. For the mean correlation coefficient between all tree-ring series, use RBAR (in figure 3 and the text) or Rbar (in table 2), please keep it consistent.

Response: we accepted. We have done.

C9. For the statistic coefficient of correlation, use "R" or "r", please keep it consistent.

Response: we accepted. We have done.

C10. References in text of the manuscript should be listed in chronological order.

Response: we accepted. We have done.

C11. Line 48: delete "Therefore".

Response: we accepted. We have done.

C12. Line 214: replace "A" with "The".

Response: we accepted. We have done.

C13. Line 261: replace “: The” with “: the”.

Response: we accepted. We have done.

C14. Line 273: delete “transitional”.

Response: we accepted. We have delete it.

C15. Line 282: replace “by large-scale climate oscillation of the ENSO”with “by ENSO”.

Response: we accepted. We have done.

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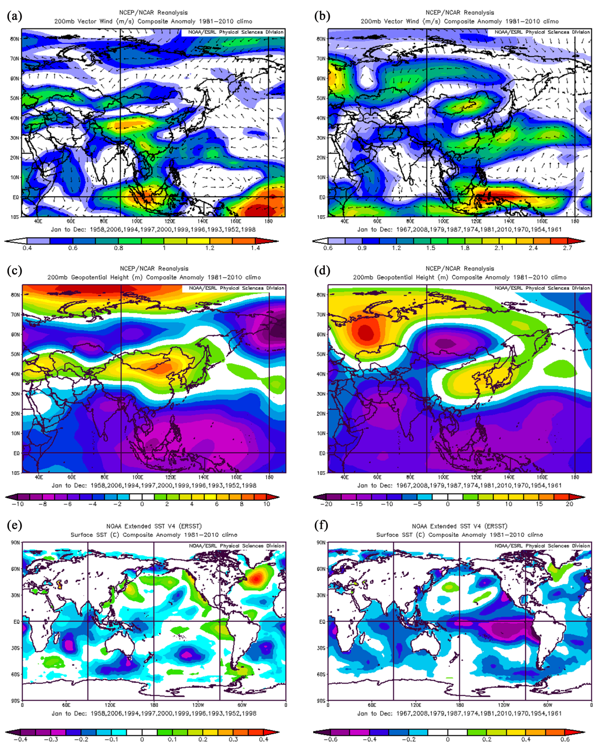

Fig. 1. Composite of the 200-hPa vector wind and Geopotential height, and SSTs (from Jan to Dec) for the 10 wettest (left) and 10 driest (right) years for the Dai-PDSI reconstruction during the 1948-2010.

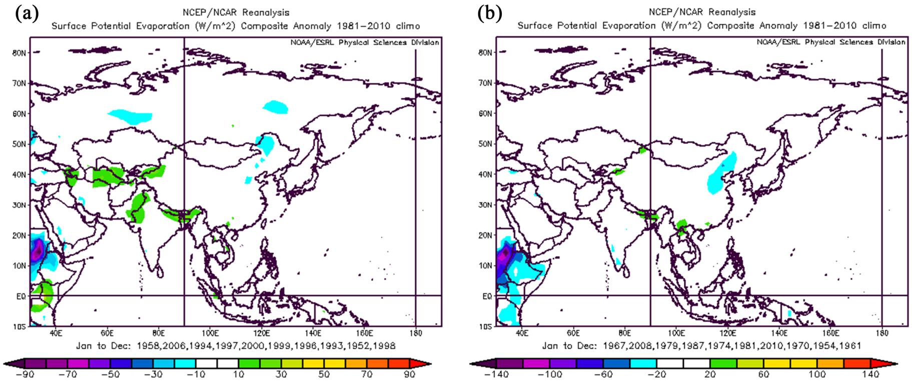

Fig. 2. Composite anomaly maps of the surface potential evaporation (W/mˆ2) (from Jan to Dec) for the 10 wettest (a) and 10 driest (b) years for the Dai-PDSI reconstruction during the period 1948–2010.