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Interactive comment on "Reconstruction of the March–August PDSI since 1703 AD based on tree rings of Chinese pine (*Pinus tabulaeformis* Carr.) in the Lingkong Mountain, southeast Chinese loess Plateau" *by* Q. Cai et al.

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Anonymous Referee #2 Received and published: 25 December 2013

This paper is an interesting and well-written paper on dendroclimatological study for East Asian Monsoon. I have a few minor and technical comments.

(1) Describe briefly the dendrological (2-needle or 5 needle pine? its distribution, eco-

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physiological setting, etc.) of Chinese pine.

Answer: We added description in the revised manuscript as follows: Chinese pine (Pinus tabulaeformis Carr.), a two-needle conifer species which is endemic to China, is the most widely distributed and the most important afforestation conifer species in northern China. It generally occurs in mountain areas at altitudes of 100-2600 m (Xu, 1990). It can tolerate very low temperature (-25 °C) and can adapt to live in low soil water availability conditions with well developed root systems. This species has been widely used for dendroclimatic researches in China (Liu et al., 2005; Liang et al., 2007; Cai and Liu, 2013).

(2) Clarify the method of crossdating; skeleton or graphic methods? or any other methods. COFECHA program is a program to verify crossdating results, not the crossdating method.

Answer: We clarified it in the revised manuscript: The Skeleton-plot crossdating method (Stokes and Smiley, 1968) was adopted to preliminarily assign the calendar years to each growth ring.

(3) page 6318 line 17: 10 'trees" may be 10 "cores' when I read Fig. 3.

Answer: Yes, it should be 10 cores. We have made correction in the text.

(4) In Fig. 5, High PDSI values during 1960s was not well predicted. It may be added in the text.

Answer: We added it in the revised manuscript.

(5) page 6322 line 10 and also Fig. 6b: I could not understand how the accumulated anomalies of PDSI was calculated. If it is not described in the Method section, add it.

Answer: We added it in the revised manuscript as follows: The accumulative anomalies of the PDSI (AC), achieved by calculating the cumulative departure from the arithmetic mean for the period of reconstruction (Wei, 2007), can intuitively and effectively eval-

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uate the long-term trend of dryness and wetness (Tian et al., 2007). The long-term trends of decreasing and increasing movement of AC indicate the persistently dry or wet conditions.

(6) Fig. 8: It is better to denote what "Iapo" stands for.

Answer: We explained it in the revised manuscript as following part. In addition to this, we also gave deeper analysis about the mechanism between IAPO and the moisture conditions in the studied area (please also see the answer to the 10th question of Reviewer # 1):

The Asian-Pacific oscillation (APO) is defined as a zonal seesaw of the tropospheric temperature in the midlatitudes of the Asian-Pacific region (Zhao et al., 2008). When the troposphere is cooling (warming) in the midlatitudes of the Asian continent, it is warming (cooling) in the midlatitudes of the central and eastern North Pacific.

(7) High correlation between tree-ring chronology and PDSI was impressive. However, I do not understand why there is rather low correlation between tree-ring chronology and precipitation. It is better to explain it physiologically.

Answer: We explained the physiological reason in the new section "4.1 Climate-growth relationship" as follows:

4.1 Climate-growth relationship Lingkong Mountain belongs to the semi-arid area where annual evaporation is more than twice of annual precipitation. High precipitation during the growth season actually benefits the radial growth of tree by providing necessary water for the radial cell division and elongation, while low precipitation limited the radial growth. Inversely, increased temperature before and during the growth season inevitably strengthen the water stress by accelerating water consumption in the soil and trees through evaporation and transpiration, resulting in the formation of narrow rings, and vice versa. Reasonably, positive correlation of tree rings with monthly precipitation and negative correlations with monthly mean temperature in current growth year was

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identified in this study, and this climate-growth pattern was generally reported in the arid to semi-arid CLP (Gao et al., 2005; Liu et al., 2005; Cai and Liu, 2013) and other areas of northern China (Liang et al., 2007).

In the present work, monthly mean temperature from March to August exerts more important influences upon tree growth than monthly precipitation (Fig. 4), which is similar to studies in the Kongtong Mountain (Fang et al., 2012), Guiqing Mountian (Fang et al., 2010a) and the Ortindag Sand Land (Liang et al., 2007), showing the temperature-induced water stress was likely the key factor limiting tree growth. The correlation analysis between PDSI and tree-ring chronology further tested the above hypothesis. Significant correlation is identified from March to August, especially significant in May and June when the temperature is comparatively high and precipitation is very low (Fig. 2), indicating an intensified drought stress.

Please also note the supplement to this comment:
http://www.clim-past-discuss.net/9/C3226/2014/cpd-9-C3226-2014-supplement.pdf

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Interactive comment on Clim. Past Discuss., 9, 6311, 2013.