

Interactive comment on “Climate patterns in north central China during the last 1800 yr and its possible driving force” by L. Tan et al.

Anonymous Referee #2

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Tan and co-workers present a synthesized 1800-yearlong precipitation record from north central China which is based on two previously published speleothem records from Wanxiang and Huangye Cave and a two drought/flood index records from historical documents from Longxi and the Haihe River basin. When compared to temperature records from China interesting relationships emerge: warmer (cool) temperatures coincide with higher (lower) monsoon precipitation. This association is not too surprising when we consider the basic driving mechanism (different sensible heating) of the Asian monsoon, and was already outlined in previously published articles (e.g. Zhang et al., *Science*, 2008). Because single proxy records are also strongly affected by local and regional climate, it is a good approach to construct a synthesized precipitation record from multiple reconstructions. Thus, the manuscript is an important step forward to better understand the patterns and forcings of monsoon precipitation in north central

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China. Based on the more robust synthesized precipitation record, Tan show that changes in solar activity are one of the main drivers of fluctuations in monsoon precipitation. Furthermore, the breakdown of the temperature-precipitation relationship in recent decades is another important aspect of the manuscript. Overall, I can support publication in *Climate of the Past* after some modifications have been made (see below):

1. The authors do not present a figure in which they show the curves of the PCA. I would like to see such a figure of all PC 1-3 for all individual records, including the D/F index records. What is the influence of chronological uncertainties on the stacked precip. record?
2. Figure 5 and associated text: On page 1035 (lines 21-23), Tan et al. state that “On multi-decadal- to centennial-scale, there is a one-to-one correspondence between the peaks of the two series (synthesized precip. record and APO index)”. I agree that there is a visual and also statistically significant correlation between both records shown in Fig. 5. However, there are also clear dissimilarities, such as between ~1500-1600 AD and 1000-1100 AD. Thus, I would soften the statement “. . .one-to-one correspondence. . .”. Furthermore, the numbering of the peaks in the synthesized precip. record is quite mysterious (at least to me). For instance, peak 7 is barely visible, whereas a distinct peak at around 1580 AD (between peaks 6 and 5) is not labeled. Please clarify.
3. It appears that solar activity has some influence on precipitation in north-central China. However, the spectral peaks of ~160 and ~35 yrs (Page 1036; lines 16-18) are not the typical solar cycles. Why is there no evidence for a 90-yr (Gleissberg cycle) or 200-yr (de-Vries cycle)?

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