Climate
of the Past
Discussions

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Interactive comment on "Timescale-dependence of the relationship between the East Asian summer monsoon strength and precipitation over eastern China in the last millennium" *by* Jian Shi et al.

Anonymous Referee #2

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Overall rating: Although the paper addresses a relevant topic and uses adequate tools major revisions are necessary to provide a substantial contribution to Climate of the Past.

The manuscript investigates the timescale dependence of the relationship between the East Asian Summer Monsoon (EASM) and precipitation over eastern China using the results of the multi-model ensemble provided by PMIP3 and the single-model ensemble of last –millennium simulations from NCAR. The paper addresses a relevant question for paleoclimate research. The often assumed connection between the EASM strength

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and Chinese precipitation variations is the basis for several monsoon reconstructions, e.g. from speleothems. Discrepancies between models and reconstructions and between different reconstructions may be rooted in the fact that the precipitation patterns over eastern China are influenced by other circulation features than the EASM. The authors look at the dependency on time-scales and find that the connection between EASM and a north-south precipitation pattern over eastern China is relatively stable over longer periods, such as the Medieval Climate Anomaly and the Little Ice Age. On shorter time-scales the relation breaks down and other mechanisms or remote drivers become likely more important for the regional precipitation distribution. Another important and robust conclusion of the analyses is that external forcing does not influence the shorter-timescale variations in the relationship between EASM and rainfall. These conclusions are based on a thorough analysis of the multi-model PMIP3 past1000 ensemble. The authors first establish the performance of individual models in representing present-day climate variations and base the selection of models on this evaluation. The results could be more robust if the athors included also the CESM single-model ensemble in the analyses of section 4.1 (see below). I am much less convinced about section 4.2, where the authors claim that a roughly 60yr oscillation in some teleconnections to the North Atlantic causes the variations in the EASM-precip relation. I don't find the collection of spectra very convincing and strongly recommend not to derive spectra from heavily-smoothed time series. The connection with the Atlantic Multidecadal Oscillation is also not well established. The correlations shown in Fig.11 show extremely low explained variance, even though they may pass a statistical significance test. In an earlier paper (Shi et al., Clim. Dyn., 2016) the principle author did a much better job in identifying teleconnections influencing precipitation patterns in a particular model. If the AMO-China precip connection is as robust as the authors claim, the multitude of realisations frim the CESM ensemble should make it possible to nail down the pathway how and to which amount the AMO influences the eastern China rainfall in comparison to the EASM.

Minor issues:

Page1, line 23 have == has Page 2, line18: do you mean "combing" or "combining"? Page 2, lines32ff and general: I recommend to reduce (increase) the wording in parenthesis in order to improve (deteriorate) the clarity of the argument. Page 3, line 5: Peng et al., 2014: for which time period? Line 6: the previous work by Shi et al is important and you should give a brief summary of their findings. Also for the later part: In Shi et al. 2016 it is concluded that only one model is able to adaequately reproduce the precipitation patterns over China in the last millennium context. Why is that not so important for the present study?

Line 21: the PMIP3 definition is exactly 850 to 1850 A.D.

Page 4, line 2, page 5, line 11: why geological? Geographical, spatial?

Page 5, line 11, figures 1,4: the "observations" are from a relatively short period (1979-2000). In the light of the later results on the non-stationarity: How does one know that this period is representative for the 20th century or longer?

Page 6, lines 6ff: The results could be made more robust if the CESM LM Ensemble simulations would be included. For example, in figure 2c one could have another entry for CESM LME including an estimate of the ensemble spread. So you would provide both a multi-model ensemble and a single-model ensemble.

Page 6, lines 14ff: I don't find the periodicity so obvious. If one requires 95% significance, only 5 out of 14 PMIP models and 3 out-of 9 LME simulations meet the criterion, hardly a very robust feature. Again, the spectra should not be calculated from smoothed data. Line 15, and page 7, line 13: There is only one Shi et al., 2016 in the reference list.

Line 29: I would say there are as significant peaks between 120 and 150 years in several of the individual forcing runs (e.g., 10 b, f,l,n)

Page 7, line 29: "geological evidence" better: from proxy data

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