

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 #1

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The manuscript observed that proxy records representing seasonal precipitation over Eastern China and East Asia, believed to be driven by the intensity of the East Asian Summer Monsoon over the past millennium, tend to disagree at decadal and multi-decadal timescales, while agreeing at multi-centennial time scales. The authors attempt to explain this apparent inconsistency by analyzing the past millennium simulations of the PMIP3 model suite and in the Last Millennium Ensemble conducted with the CESM Earth System Model. The main conclusion is that the climate models exhibit a similar behaviour as the proxy records, with robust relationship between the

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simulated EASM and simulated East Asian precipitation, while showing inconsistent or high variable links between the ESM and precipitation at multidecadal timescales. The authors also conclude that the variability between EASM and precipitation is caused by internal climate dynamics - not related to the external climate forcing. In this regard, the sea-surface temperatures in the North Atlantic seem to play a role in this variable link.

In general terms, I think the manuscript is well written and its objectives are appealing. I am less satisfied with the last part of the manuscript, which includes the spectral analysis of the links between EASM and precipitation and the possible role of the North Atlantic SSTs. I think that this part is very speculative in less well supported than the rest. In my view this part requires some revisions, both considering the methods applied and possibly also the conclusions.

The English usage - for me a non native English speaker - also requires some light polishing.

Main points.

-The manuscript reads well and is convincing until section 4.2. In this section looks into the spectral characteristics of the correlation between the EASM and precipitation in the model simulations. It claims that there exist a 60-year quasi periodicity in almost all PMIP3 simulations and the CESM ensemble. I have two main concerns. One is that the spectra of the running correlations in the CESM ensemble do not really look similar in the different ensemble members. This ensemble has been conducted with the same forcing and with the same model, so that the spectra - if they represent a real signal - should look, in my opinion, much more similar. For instance, the simulation in left column middle row shows a spectrum that is very different from the simulation in the right column middle row. This means that either the statistical significance of the spectral peaks is not really well estimated: the peak at about 130 years that appears in this latter simulation as significant does not appear in any other ensemble member.

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This may be due to the construction of the time series. The running correlation are calculated with a 31-year filtered applied to the EASM and precipitation time series. I suspect that this filtering may introduce spurious peaks in the spectrum, although it is difficult ascertain before hand. I suggest to calculate the spectrum of a time series resulting from calculating the running correlation of random time series and see in how many cases spurious spectral peaks arise . I found a bit suspicious that the spectral peaks that the authors claim are twice and four times the period of the running window width.

-The explanation of the involvement of the North Atlantic SSTs on the link between EASM and precipitation is actually very weak. It is based on a statistical result without any physical explanation. This is a reflection of another weakness in the study. The authors clearly show that there are multi-decadal periods where the link EASM-precipitation breaks down. This must have a local and immediate reason, for instance that in those periods other local patterns of variability vary more strongly, or that the sources of moisture in the Western Pacific become colder or other similar reason. But if there is a long-distance effect of the North Atlantic SSTs, this has to be mediated by a regional mechanism, and this is not explored at all in the study. In addition, the correlations displayed in Figure 11 are really low. This figure also shows the area where at least 7 of the nine ensemble members show the same sign of the correlation. However, this result may not be that significant as it seems at first sight. On average 4 or 5 simulations will show the same sign, so that 7 can be not that unusual when considering that this test is applied to all grid cells of the simulation at the same time (this is the simultaneous multiple test problem or field significance). In other words, the chances that one single region in the world passes the 7-over-nine-same-sign test are probably not that low.

Minor points

3. Page 2, line 5: 'aforementioned EASM-precipitation relationship is possibly changeable over recent decades (e.g., Shi and Zhu, 1998; Li et'

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Perhaps, changeable -> not stable

4. s. Peng et al. (2014) also implied that several severe droughts that occurred over eastern China were

Peng et al is not in the reference list

5. page 3, line 21 : 'ESM because of its climate drift in long-term simulations (Gupta et al., 2013). These simulations have a rough time span '

rough time scale -> approximately cover a span

6. Page4, line2 :Specifically, we calculate the geographical distributions of the correlation between the EASM strength and summer precipitation

geographical -> spatial

7. Page 4, line 11: ' CGCM3) to 0.79 (GISS-E2-R), all passing the 95% significance test. The centered root-mean-square errors range from 0.99 (MRI-CGCM3) to 1.55 (HadCM3),

are over the 95% significance level.

units for rmse are missing - I guess they are m/sec

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