Responses to Reviewer#1

I thank the authors for considering my comments and for revising the manuscript accordingly. However, I still have one concern regarding the connection between the North Atlantic and the variations in the link between Monsoon and East Asia precipitation, as I explain below.

The authors do include a physical explanation to explain this link, via the modulation of temperature in East Asia by the North Atlantic SSTs. In their Fig S3 they show the composite fields of Asian temperature stratified by phases of the North Atlantic SST. Colder periods in East Asia should cause stronger precipitation-Monsoon link due to more effective condensation. In this chain of reasoning, I think there is a missing link, though. The authors should show in the first place that the air temperature in East Asia temperature is indeed the driving factor. This could be shown by calculating similar composite patterns as in Fig S3 but stratified by the precipitation-Monsoon links, i.e. constructing means of Asian temperature i periods where the precipitation-Monsoon link are weaker or stronger. Alternatively, they could show a figure similar to Fig11 but also showing the temperature over land in East Asia or over whole Asia for that matter. If the authors' hypothesis is true, we should see a clear correlation to air temperature.

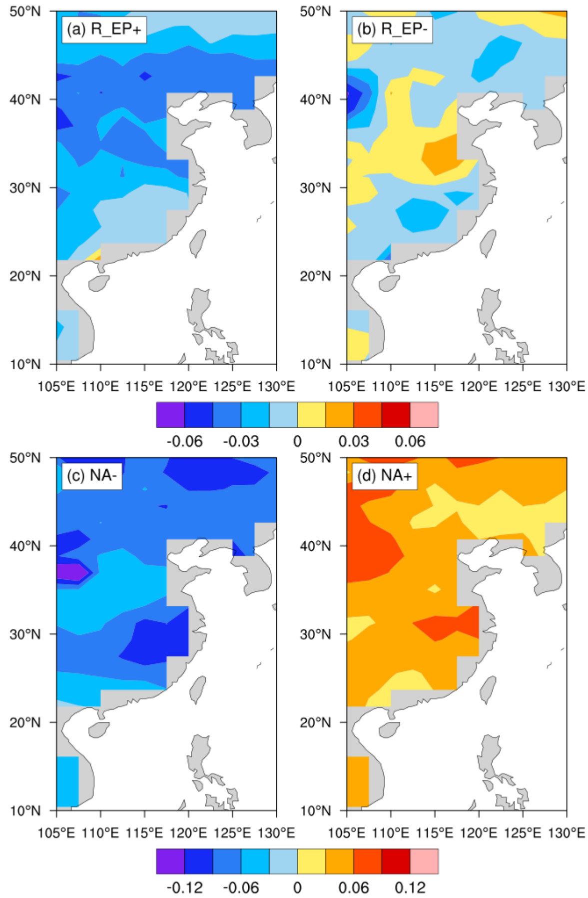

Figure 12. The summer surface temperature anomalies during the (a) high (RC+) and (b) low (RC-) EASM-precipitation relationship intervals in the CESM-LME full-forcing experiments; (c) and (d) are the same as (a) and (b), but for the clod (NA-) and warm (NA+) phases of summer SSTs over North Atlantic, respectively. The RC+ (NA+) and RC- (NA-) are selected for the periods that the EASM-precipitation relationship (summer SSTs over North Atlantic) exceed its 1.2 and -1.2 standard deviation, respectively. Units: °C

As you suggested, we add Fig. 12 to show the connection between the EASM-precipitation relationship (RC+) and East Asian temperature (EAT). When the summer EAT is lower than normal, the RC tends to be closer (Fig. 12a), which could be explained by the temperature-condensation mechanisms proposed in Page 7, Lines 29-31. However, the temperature anomalies during periods of RC- (Fig. 12b) is not exactly opposite to that during the RC+ periods. This result suggests that the linkage between the EAT and RC is not simply linear, which further demonstrates the connection between the North Atlantic SSTs and EASM-precipitation relationship is very complicated. In the revised manuscript, we add some discussions on this point (Page 7, Line 30-34).

Responses to Reviewer#2

The authors have included more information from the CESM Last Millennium Ensemble (LME). However, this could be extended a bit in discussing the uncertainty regarding the single model results. For example, Figure 2c should be discussed further in connection with Figure S3 (which shows the same thing as far as I understood). In the LME runs, (fig. S3) the individual members show dramatic differences (3-4 with positive sign, 4-5 with negative sign. If such a distribution was representative for ensembles from the other models, one would have to conclude that the findings from individual runs (Fig. 2c) could be just by chance. I would also suggest providing a Taylor diagram figure in the supplement (as Fig. 1b) for the CESM LME.

We add some discussions on the uncertainties of the models results (Page 9, Line 6-11).

Although we use large amounts of climate simulations, uncertainties are inevitable. For example, PMIP3 simulations have robust signs in the climate anomalies between the MCA and LIA (Fig. 2), while the CESM-LME results vary largely among individual experiments (Fig. S3). The CESM simulations are driven by the same forcings and are only different in initial conditions. That is to say, the roles of external forcings are sensitive to initial conditions at least in the CESM-LME. It further implies that the conclusion based on the PMIP3 may just be a coincidence, while it is difficult to validate in the present study. Therefore, it is necessary to use more PMIP3 single model runs with different initial conditions to confirm the hypothesis.

In addition, we add a Taylor diagram figure (Fig. S3) to evaluate the performance of CESM-LME members to reproduce the modern EASM and EASM-precipitation relationship.

Minor issues:

Page 3, ln 31: better: nine CESM-LME full-forcing experiment, one control experiment, and several sensitivity experiments with individual forcing (…

Modified (Page 3, ln 31).

Page 6, ln 24ff: the "obvious" depends a bit on the view of the reader. In many simulations the 100-200 year periods are much more prominent that the 40-60 years. The authors play the lower-frequency a bit down, put it is very prominent when looking just at the RPC time series from, e,g, MPI-ESM-P.

We acknowledge that the centennial periodicities are also neglected in several simulations. First, the purpose of this study is to discuss the origins of mismatching among reconstructions on short-timescales, thus we pay more attention to their multi-decadal fluctuation. Second, the centennial periodicities are not as common as the multi-decadal periodicities among simulations, thus we thought it may not be a robust sign. Based on the above considerations, we mainly focus on the 40-60 years periodicities.

Page 7, ln 15ff. along the same line: the 120-150 year period is prominent both in the inforced control run and the MME. Is there any evidence from other analyses of the LME where this comes from?

Thank for pointing this issue out. We note that the 120-150 year period appears not only in the control run and but also in full-forcing runs ensemble, implying that this cycle is possibly induced by both internal and external forcings, and the role of external forcings may be more important.

According to Fig. S5, this cycle appears in almost all single forcing members expect for the orbital experiments. However, it is hard to say that these periods are caused by the corresponding forcings, because the internal variabilities of the climate system are not removed. Moreover, the 120-150 period is not always prominent in the experiments driven by a same forcing. One likely reason is that the external and internal forcings both influence the EASM-precipitation relationship, but their combinational effects vary largely among members. This issue increases the uncertainties of this study and is beyond the scope of present study. We will explore it in our future work.

Page 8, ln 1ff: The fact that AMO is more consistent among ensemble members implies that AMO is more directly nfluenced by external forcing. This issue is discussed in a manuscript on a recent reconstruction of the AMO (Wang et al Nature Geosciences, 2017, doi:10.1038/ngeo2962), which could be included here.
We add the reference of Wang et al. (2017). (Page 13, Line 15-16)