Climate
of the Past

Open Access

EGU

Discussions

Interactive comment on "Identifying teleconnections and multidecadal variability of East Asian surface temperature during the last millennium in CMIP5 simulations" *by* Satyaban B. Ratna et al.

Anonymous Referee #1

Ratna et al., examined the relationships between AMO/PDO and surface temperature in East Asia (TAS) at multidecadal time scales based on models and reconstructions data, found that external forcing greatly strengthened the relationship between AMO and TAS but weakened relationship between PDO and TAS, and discussed the volcano influences. This is an interesting study on how external forcing influences on teleconnetions between AMO/PDO and TAS. However, I still have some concerns on this study.

Major concerns: 1) On the reliability of model and reconstruction data. Compar-

isons between modeled PDO/AMO from (CCSM4, MPI-ESM-P, BCC) with observed PDO/AMO index from HadISST/NCDC ERSST during the period of 1870-2000 should be added to evaluate the reliability of PDO/AMO index from model. There are several PDO/AMO reconstruction (such as, Gray et al., 2004; Shen et al., 2006). Although such PDO/AMO reconstructions are relatively short, the results seem more convincing by adding these records. In addition, there are published and robust Asian summer temperature reconstructions (e.g. Cook et al., 2013, Shi et al., 2015), such reconstruction data should be used. Comparisons among different reconstructions are as important as comparisons among the different models.

Shen, C., W.-C. Wang, W. Gong, and Z. Hao. 2006. A Pacific Decadal Oscillation record since 1470 AD reconstructed from proxy data of summer rainfall over eastern China. Geophysical Research Letters, vol. 33, L03702, 2006. Gray, S.T., L.J. Graumlich, J.L. Betancourt, and G.T. Pederson. 2004. A tree-ring based reconstruction of the Atlantic Multidecadal Oscillation since 1567 A.D. Geophysical Research Letters, 31:L12205, doi:10.1029/2004GL019932. Cook E R , Krusic P J , Kevin J. Anchukaitis et al. Tree-ring reconstructed summer temperature nomalies for temperate East Asia since 800 C.E. Climate Dynamics, 2013, 41(11-12):2957-2972. Shi F , Ge Q , Yang B , et al. A multi-proxy reconstruction of spatial and temporal variations in Asian summer temperatures over the last millennium. Climatic Change, 2015, 131(4):663-676.

2) On PDO signal. PDO has clear decadal and inter-decadal signal. Figure 11 also showed significant 15-20 years periods for PDO. However, all the time series are passed through a 30-year low pass filter using the Lanczos filter, which may miss key information of PDO. 10-year low pass filter should be used for PDO analysis.

3) On Volcano influences. Although previous studies showed that volcano eruptions affected decadal climate changes, it is equivocal that volcano eruptions affected multidecadal climate changes. For example, TAS reconstruction showed clear volcanic forcing signal, and volcano eruptions resulting in pulses of cooler summer conditions that may persist for several years (See Figure 12 in Cook et al., 2013). However, this study

showed that there were not significant correlations between TAS and volcanic forcing (Figure 8c). In addition, superposed epoch analysis (SEA) should be used to test the impact of explosive volcanism on temperature.

4) On time scales of external forcing. there are other external forcings (e.g. solar activity) that should be considered. Solar activity has multi-decadal periods.

5) On influences of external forcing, external forcing greatly strengthened the relationship between AMO and TAS but weakened relationship between PDO and TAS. Do you think such results are related to definition and calculation of AMO and PDO? In simple terms, AMO reflects average SST, but PDO reflects spatial configuration of SST. So AMO may be related to external forcing while PDO may be related to internal variability.

Minor Concerns:

1) Page 3, Line 20-22. For temperature over East Asia, TAS reconstruction is summer temperature, and TAS model data is summer, cold season temperature and annual temperature. It is confusing. Please clarify which season temperature used in Figure 3-8 in Figure caption.

2) Page 13, Line 9, East Asiantemperature should be East Asian temperature.

3) Figure 7a, the label for y axis for volcanic forcing should be added.

4) Figure 8, confidence level explanation should be added.