

We appreciate the reviewer's comments and suggestions on our manuscript. Our replies follow each of reviewer's comments or suggestions.

1) Page 3, line 23, and throughout the paper. The usage of GMT can be avoided as it gets confused with Greenwich Mean Time.

Response: We have changed "GMT" to "GMST" in our revised manuscript.

2) Page 5. Need some more clarity in explaining the EPR method. Eg. It is difficult to find out what is real change (C_{real}), how it is computed. The variable N is not defined. Similarly, the variable M , is it the number of models?

Response: We agree with the reviewer's suggestion to explain the EPR method more clearly. However, real change (C_{real}) is just an idealized concept that cannot be computed. What we actually computed was the estimation of common change bias (\hat{C}'). Then, corrected MMM change is estimated as $\bar{C}_c = \bar{C} - \hat{C}'$, where $\bar{C} = N^{-1} \sum_{i=1}^N C_i$. Thus, \bar{C}_c can represent C_{real} more reasonably than \bar{C} . In addition, N is the number of models and M is the number of EOF modes. We have added some explanations in Section 2.2 Methods as follows:

"Although it is impossible to get C_{real} , we can close in on it by reducing the bias. And that is what this method tries to do."

"Thus, \bar{C}_c can represent C_{real} more reasonably than \bar{C} ."

3) Page 7, line 25, Is it 14 or 15 models? Why 14 models are used, in Figure 5, instead of 19 models.

Response: We actually used 14 models (fixed) when geopotential height is analyzed. Values of 500-hPa geopotential heights in five models (vary from 2800 to 5300) are much smaller than those in the other models (about 5700 to 5900) in the RPC4.5 runs over the EASM region. Thus, simulations of 500-hPa geopotential height in these five models may not be reliable. Another consideration was that we suspected something was wrong with these data. We obtained the same result, however, after

downloading these data again. As a result, geopotential heights in these five models have been eliminated from our analyses. We have added the following explanations in Section 2.1 Data:

“Due to intrinsic errors of simulated 500-hPa geopotential height in the RCP4.5 runs of five models, only 14 models are used in geopotential height analysis.”