Supplementary Materials for

Observed Multi-Timescale Differences between Summertime Near-Surface Equivalent Temperature and Temperature for China and Their Linkage with Global Sea Surface Temperatures

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Figure S1. The dominant IMF component for (a) T and (b) T_e from the EEMD results. Note that the dominant mode is defined by having the largest variance among all IMFs.

Figure S2. The percent contribution of the variance of each IMF (rows 1~5) to the total variance, units: %. Column a (b) shows the results of T (T_e).

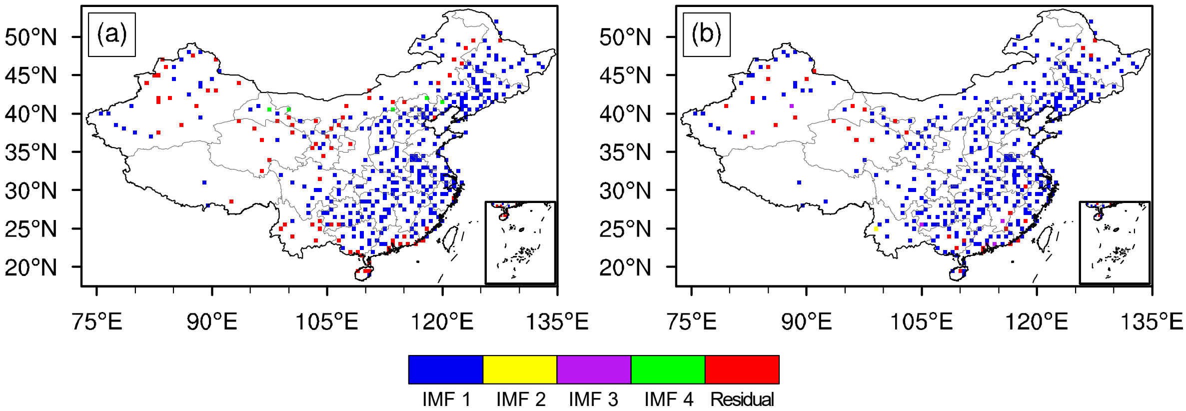
Figure S3. Box and whisker plots of (a,c) $|r_{PC}|$ and (b,d) $|r_{EOF}|$ from the bootstrap resampling procedure. The results for T (T_e) are shown in the upper (lower) row. The meanings of the box-whisker plot are also shown in the figure. Navy, Orange, Gray, Yellow and Light blue in each figure represent the statistics of correlations at IMF 1, IMF 2, IMF 3, IMF 4 and residual component scale, respectively.

Text S1. Bootstrap Resampling Procedure

Figure S4. The spatial distributions of correlation coefficients between preceding winter SST and PCs of the first REOF mode of the IMFs (Left panel: T; Right panel:T_e). (a, b) IMF 1; (c, d) IMF 2, (e, f) IMF 3, (g, h) IMF 4. Black dots represent the correlation coefficients that are statistically significant at 5% level.

Figure S5. The spatial distributions of correlation coefficients between spring SST and PCs of the first REOF mode of the IMFs (Left panel: T; Right panel:T_e). (a, b) IMF 1; (c, d) IMF 2, (e, f) IMF 3, (g, h) IMF 4. Black dots represent the correlation coefficients that are statistically significant at 5% level.

Figure S6. The spatial distributions of correlation coefficients between summer SST and PCs of the first REOF mode of (a) T; (b) T_e at the residual scale.



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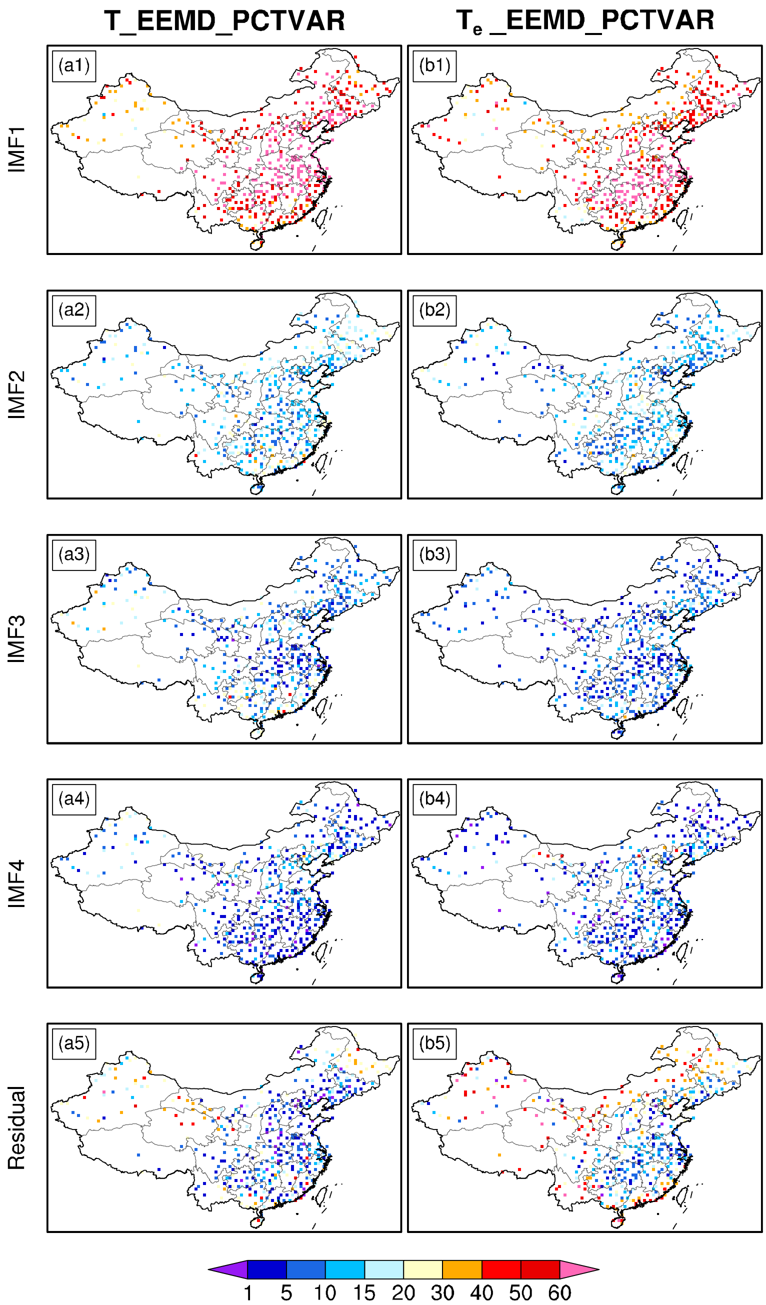

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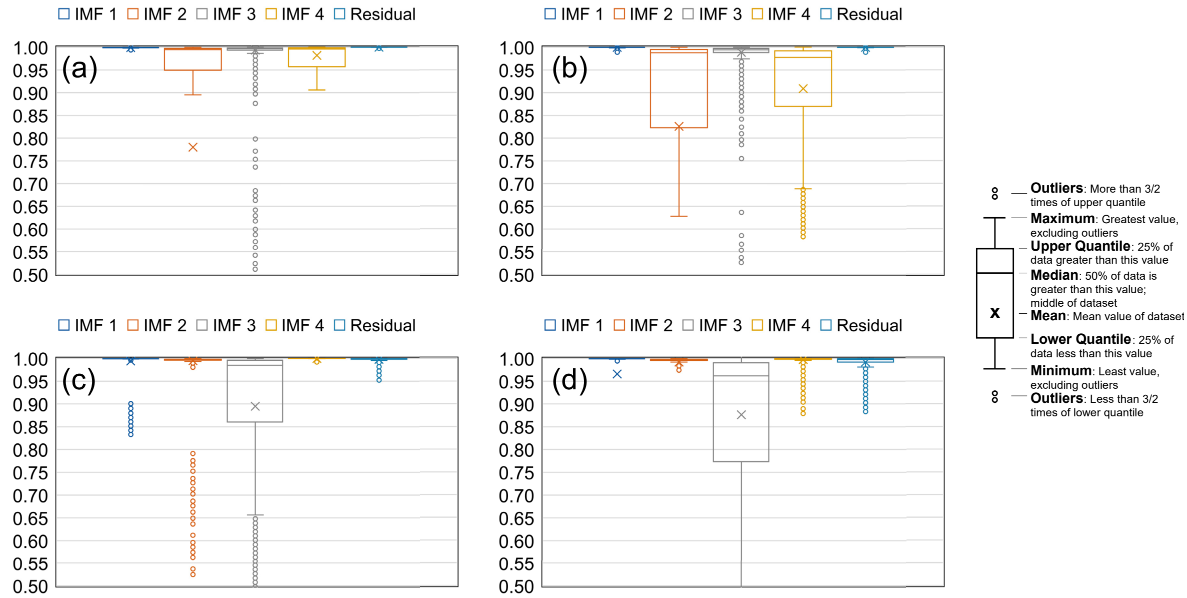


Figure S3. Box and whisker plots of (a,c) $|r_{PC}|$ and (b,d) $|r_{EOF}|$ from the bootstrap resampling procedure. The results for T (T_e) are shown in the upper (lower) row. The meanings of the box-whisker plot are also shown in the figure. Navy, Orange, Gray, Yellow and Light blue in each figure represent the statistics of correlations at IMF 1, IMF 2, IMF 3, IMF 4 and residual component scale, respectively.

Text S1. Bootstrap Resampling Procedure

Here, we have introduced the bootstrap resampling method to test the sensitivity of the EOF/REOF results to the stations selection. Detailed procedures are as follows:

1. A random number N_r between 2/3 (i.e., 272) to 4/5 (i.e., 327) of the total number (i.e., 408) of quality-controlled redistributed grids is selected.
2. Based on N_r, we create a sample that contains the EEMD-decomposed T (T_e) by randomly selecting N_r stations from the original data. The selected sample has the dimension of 5 IMFs × 57 years × N_r grids.
3. Calculating the REOF results for the above-created sample at each timescale.
4. Calculating the correlation coefficient (r_{PC}) between the original REOF-PC and the sample's REOF-PC, and the pattern correlation (r_{EOF}) between the original REOF loadings and the sample's REOF loadings.
5. Repeating the above 4 steps 10,000 times.

After the above steps, we can get 10,000 correlations at each timescale for each temperature index (i.e., T and T_e). The statistics of 10,000 correlations at each timescale for each temperature index are shown in Figure S1.

Generally, for T, the correlations between bootstrap-derived PCs and the original PC show very high values at all timescales (almost all the correlations are more than 0.9, except the outliers). The pattern correlations between bootstrap-derived EOF loadings and the original EOF loadings resemble that of PCs but with slightly weaker correlations at IMF 2 and IMF 4 relative to PCs (75% of the correlations are more than 0.8 for all timescales). Similar to T, r_{PC} and r_{EOF} for T_e at all timescales also show very high values (75% of the data are more than 0.75). From those results, we can conclude that the REOF1 spatial-temporal patterns at each timescale shown in our manuscript are generally not sensitive to changing the number and distribution of the stations.

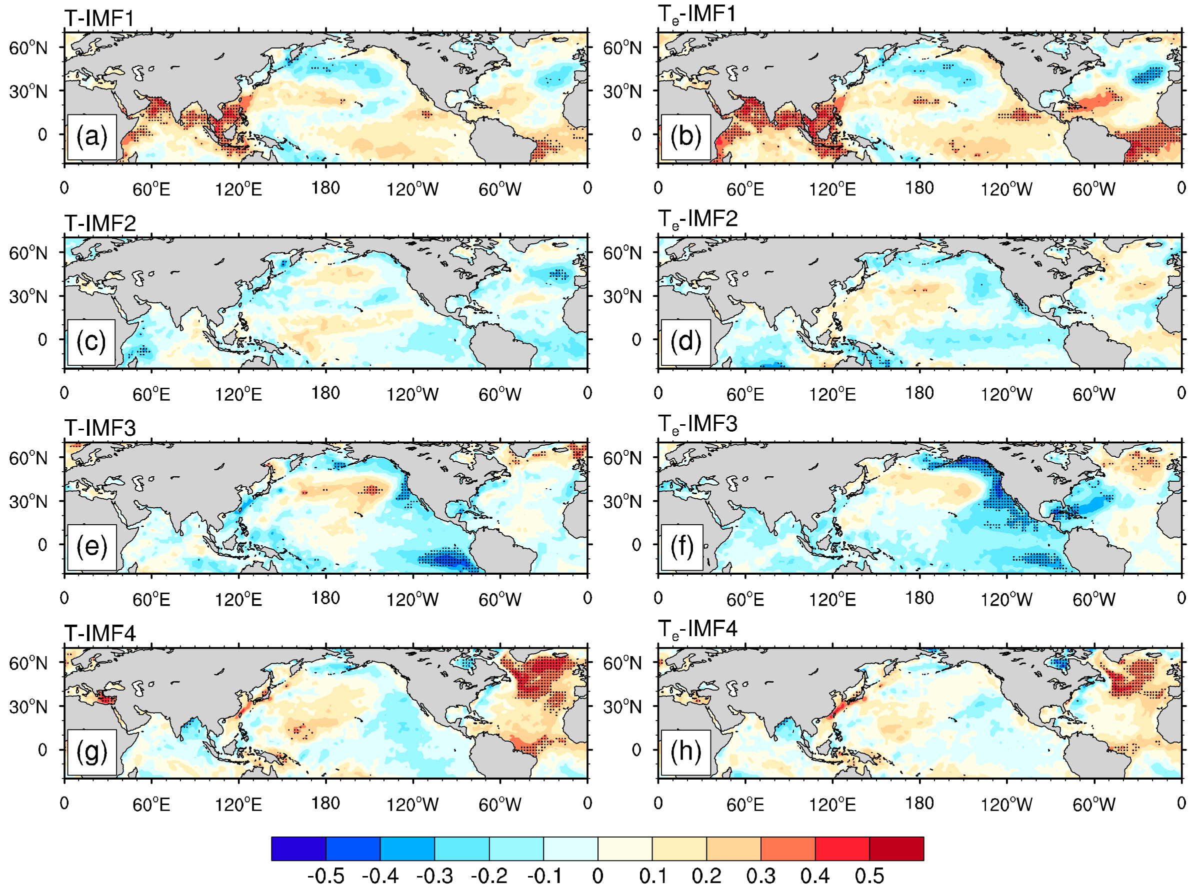


Figure S4. The spatial distributions of correlation coefficients between preceding winter SST and PCs of the first REOF mode of the IMFs (Left panel: *T*; Right panel: T_e). (a, b) IMF 1; (c, d) IMF 2, (e, f) IMF 3, (g, h) IMF 4. Black dots represent the correlation coefficients that are statistically significant at 5% level.

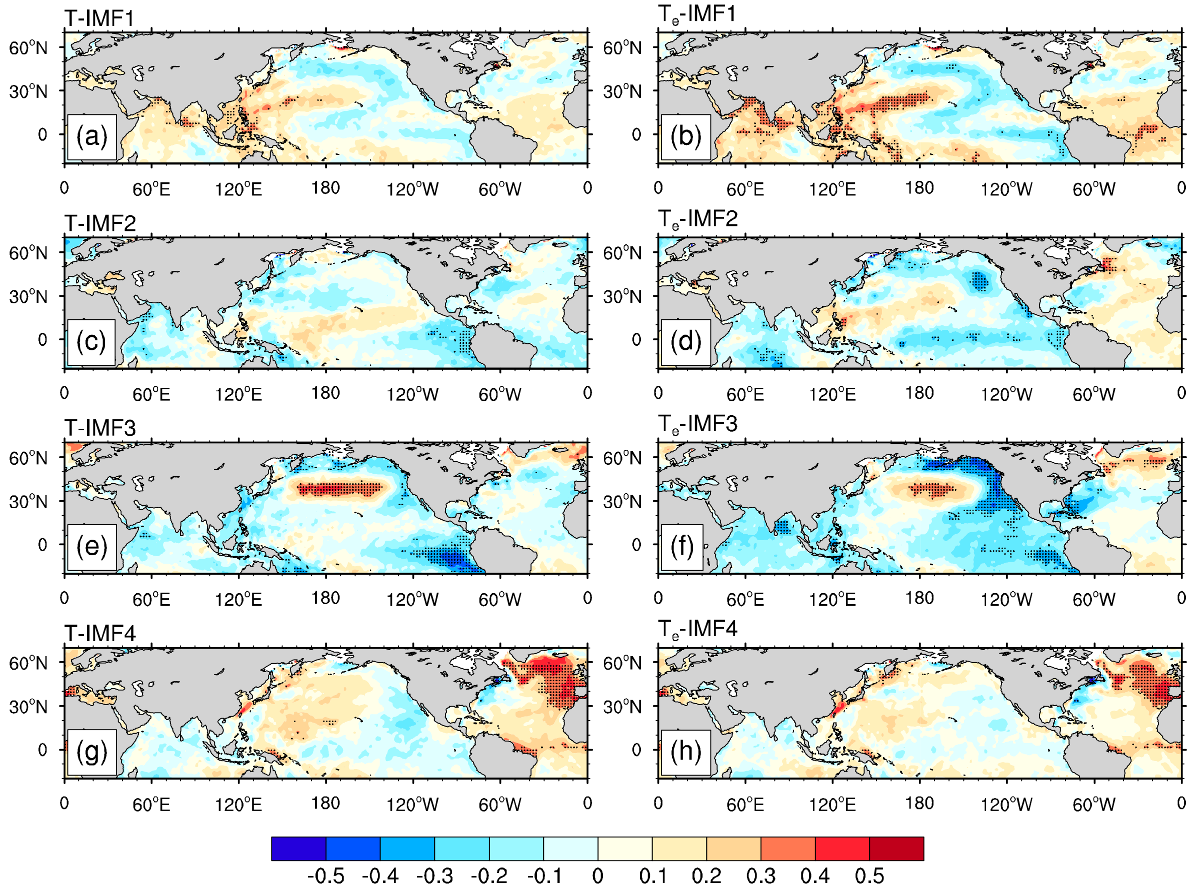
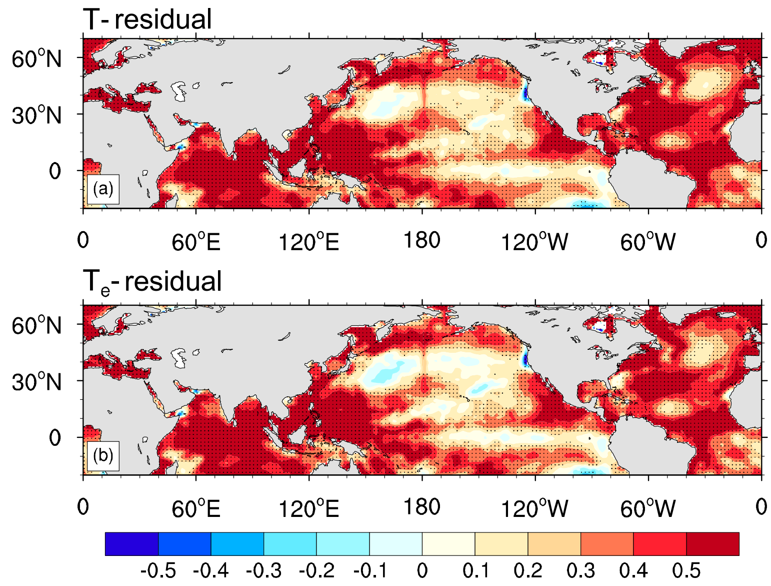


Figure S5. The spatial distributions of correlation coefficients between spring SST and PCs of the first REOF mode of the IMFs (Left panel: T; Right panel: T_e). (a, b) IMF 1; (c, d) IMF 2, (e, f) IMF 3, (g, h) IMF 4. Black dots represent the correlation coefficients that are statistically significant at 5% level.



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