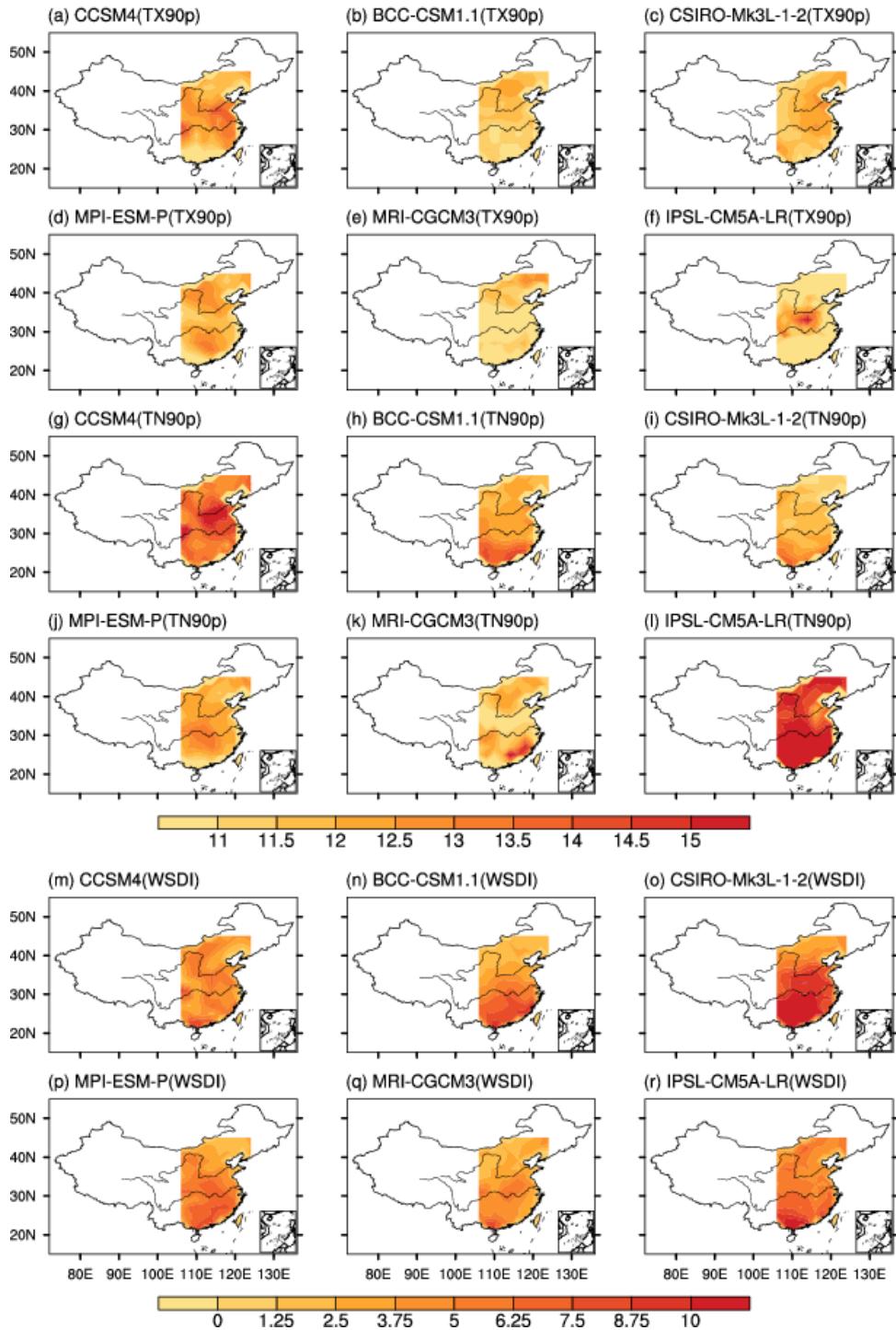


## Models(1961-2005 CE)

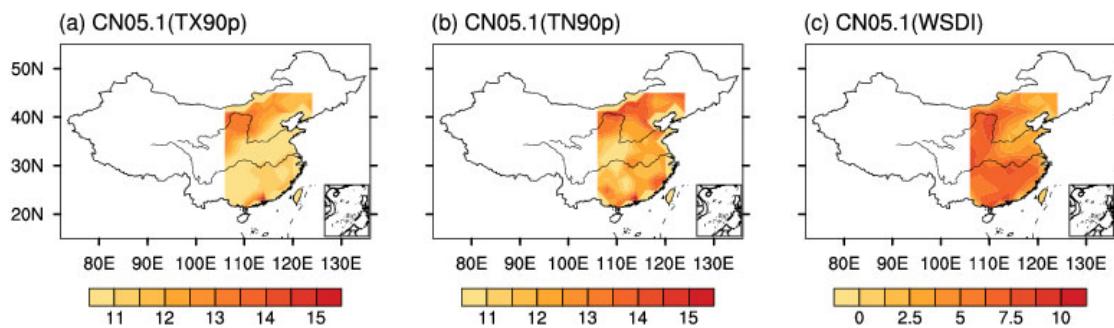


**Figure S1.** The simulated mean TX90p (Units: days), TN90p (Units: days), and WSDI (Units: days) indices during 1961-2005 CE in monsoonal China.

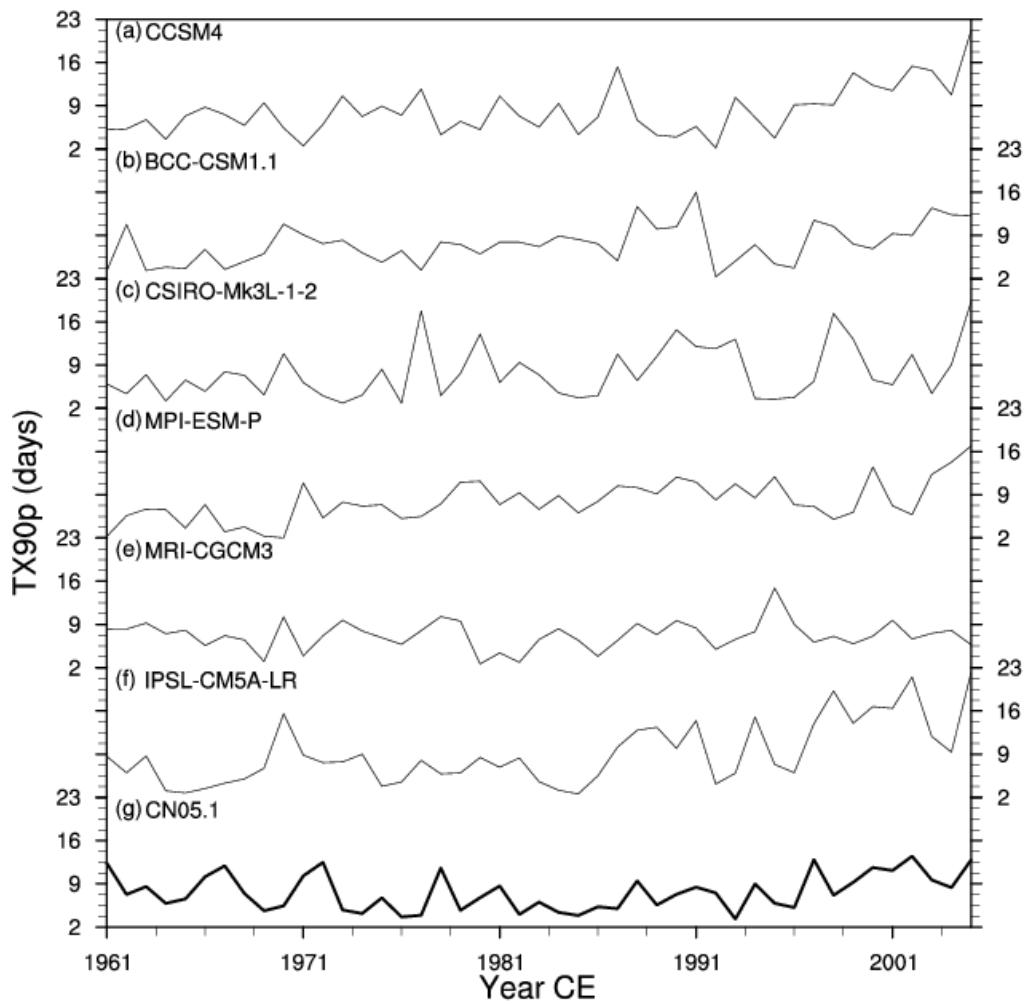
**Table S1.** Volcanic and solar forcings used in LM experiments.

Model	Volcanic forcing	Solar forcing
CCSM4	GRA	VSK
BCC-CSM1.1	GRA	VSK+WLS
CSIRO-Mk3L-1-2	CEA	SBF
MPI-ESM-P	CEA	VSK+WLS
MRI-CGCM3	GRA	DB+WLS
IPSL-CM5A-LR	GRA	VSK+WLS

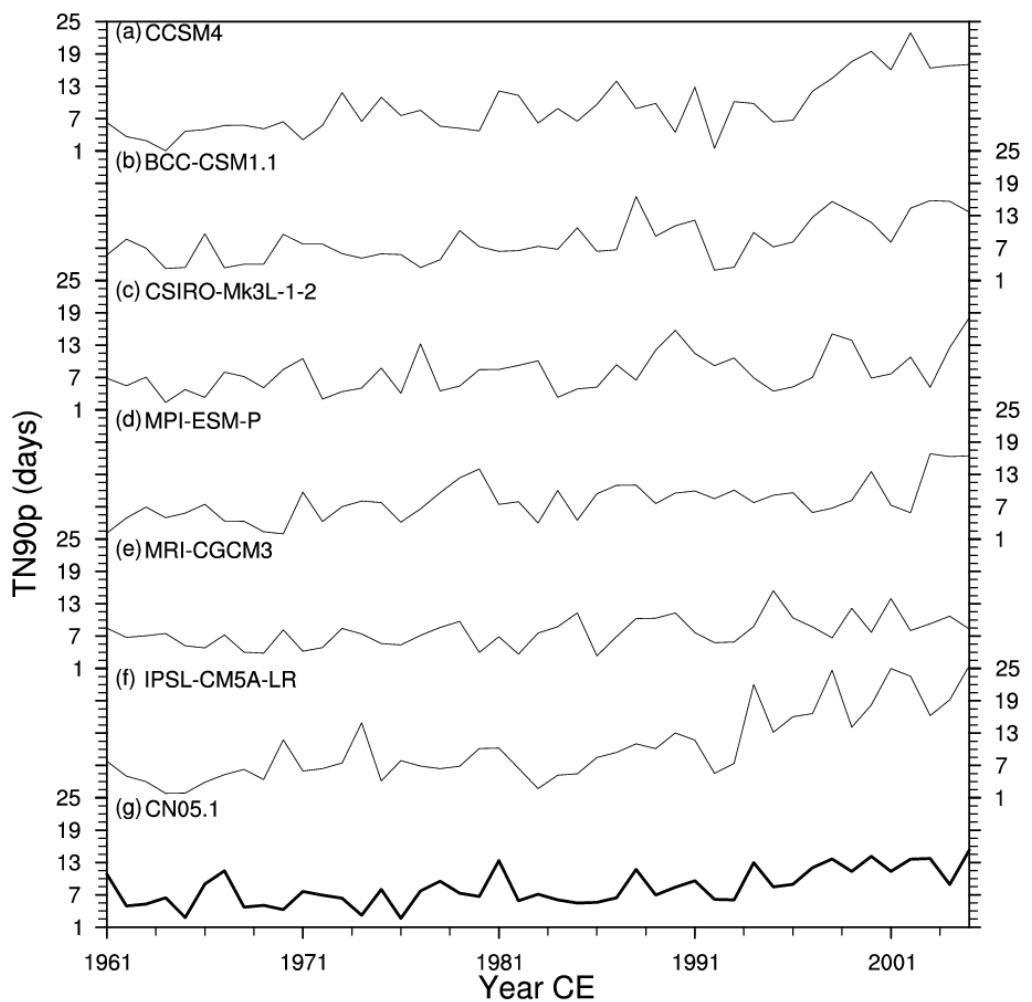
## Observation(1961-2005 CE)



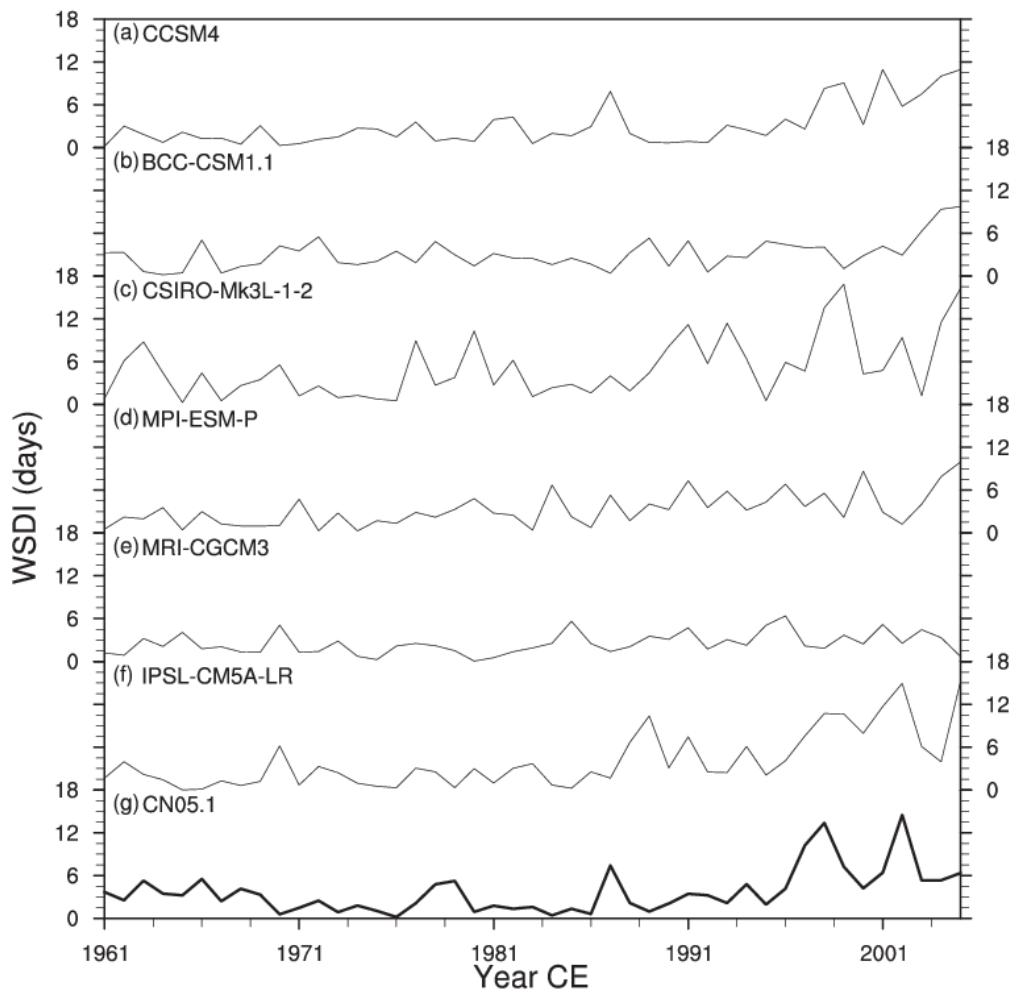
**Figure S2.** CN05.1 observed summer mean TX90p (Units: days), TN90p (Units: days), and WSDI (Units: days) indices during 1961-2005 CE in monsoonal China.



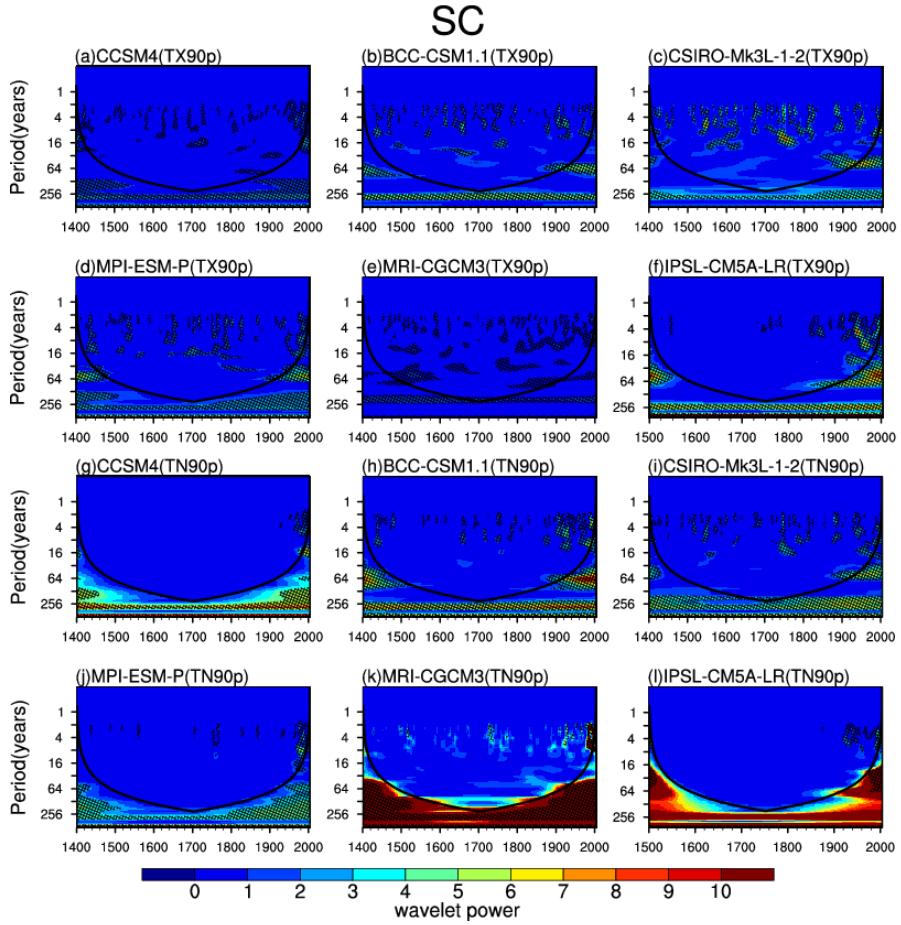
**Figure S3.** Time series of simulated and observed TX90p area averaged in monsoonal China during 1961-2005 CE. The units of this index are converted to days.



**Figure S4.** Time series of simulated and observed TN90p area averaged in monsoonal China during 1961-2005 CE. The units of this index are converted to days.

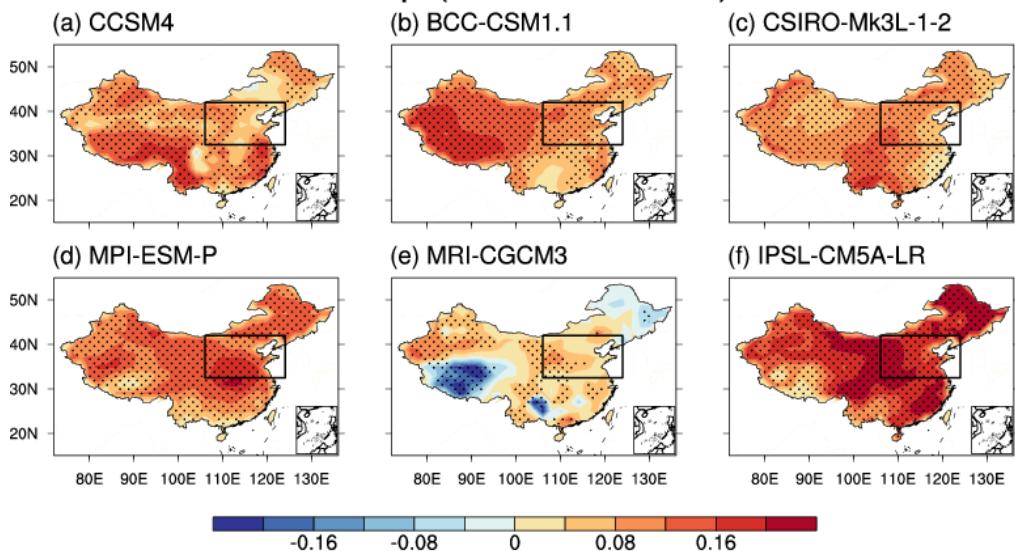


**Figure S5.** Time series of simulated and observed WSDI area averaged in monsoonal China during 1961-2005 CE.

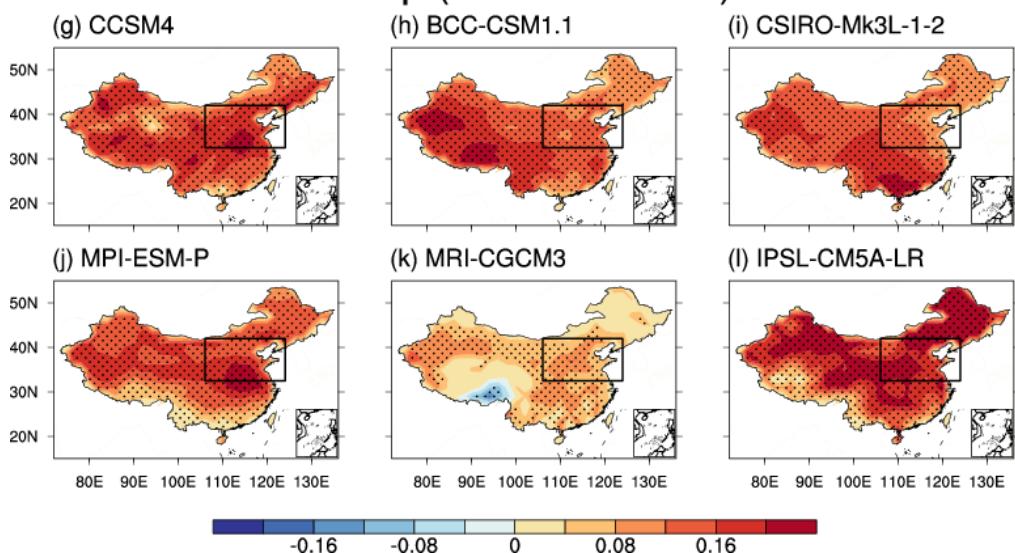


**Figure S6.** Wavelet analyses of TX90p and TN90p in SC from 1400-2005 CE. (a-f) Simulated TX90p by six models. (g-l) Simulated TN90p by six models. The shaded area show the periods with confidence levels higher than 95% and the cone of influence is shown as black line.

### TX90p (1650-2005 CE)

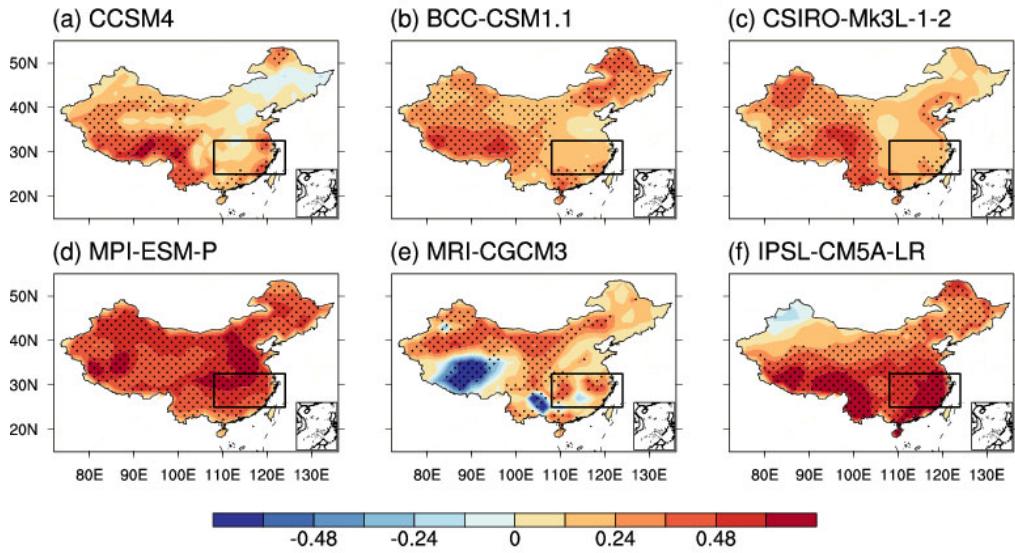


### TN90p (1650-2005 CE)

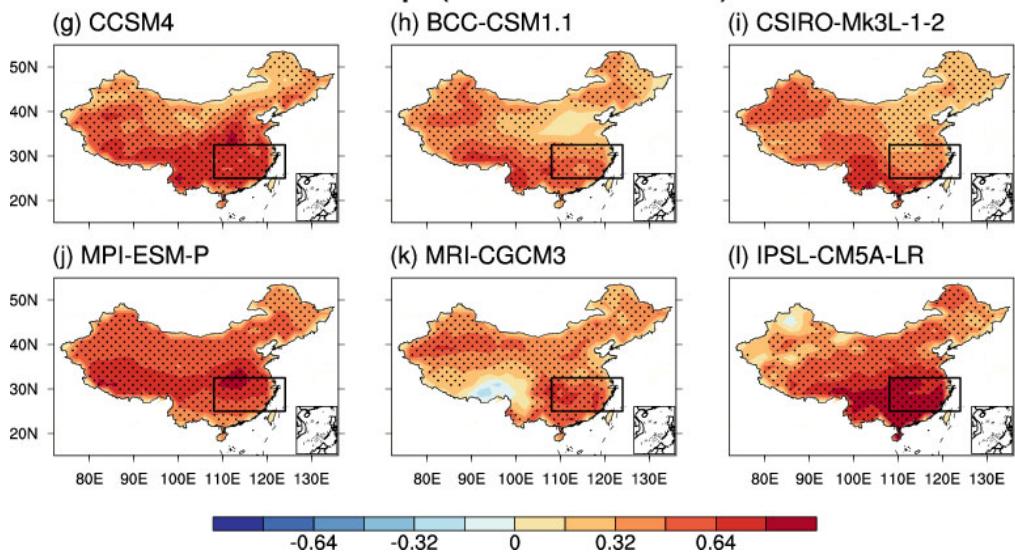


**Figure S7.** Trends distribution of summer extreme temperature indices in days per decade from 1650-2005 CE. The dots represent the trends are significant at 95% confidence level.

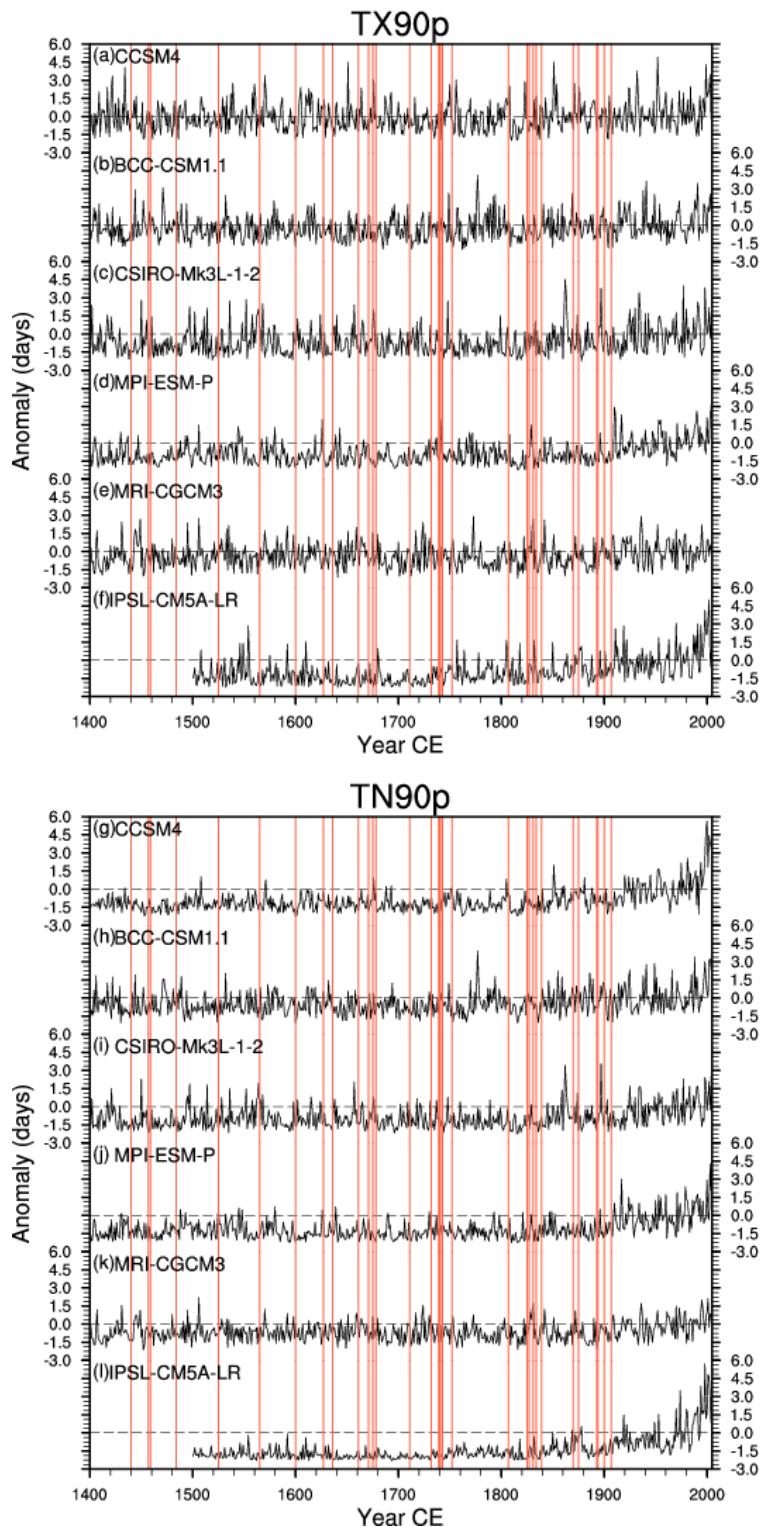
### TX90p (1850-2005 CE)



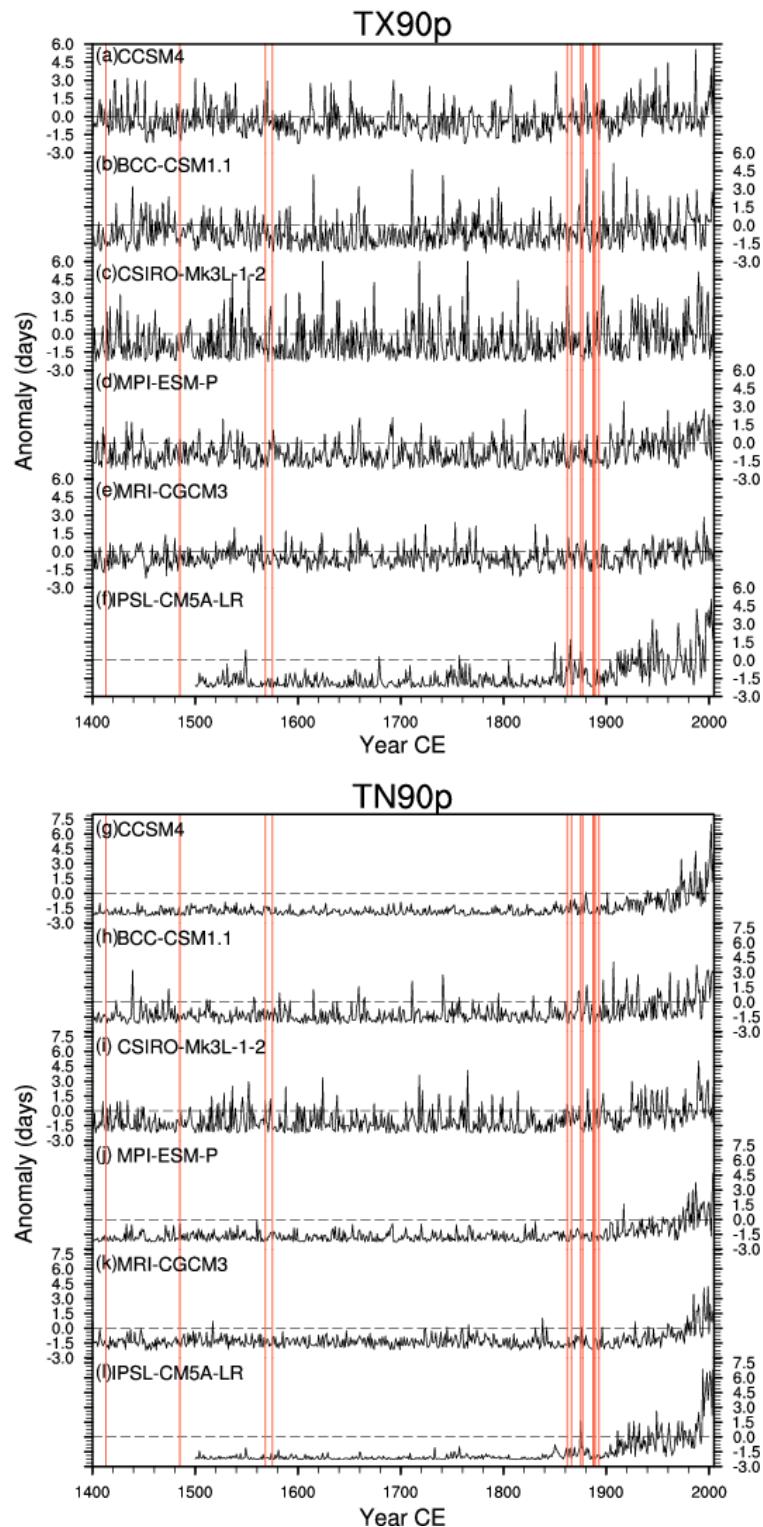
### TN90p (1850-2005 CE)



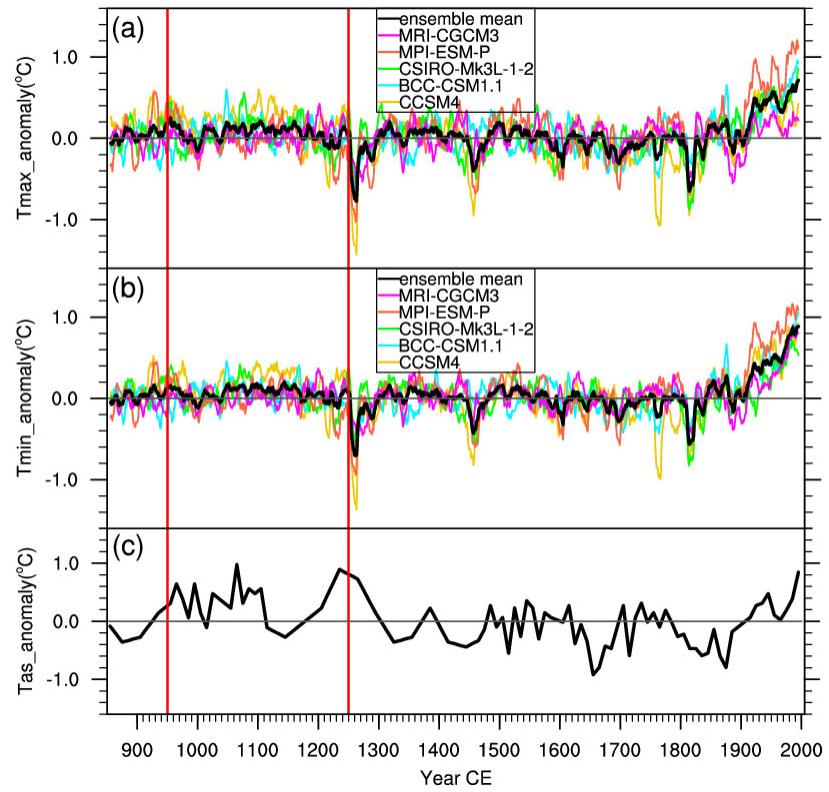
**Figure S8.** Trends distribution of summer extreme temperature indices in days per decade from 1850-2005 CE. The dots represent the trends are significant at 95% confidence level.



**Figure S9.** Time series of summer TX90p and TN90p during 1400-2005 CE in NC. The red lines represent the extreme events in Chinese historical documents.



**Figure S10.** Time series of summer TX90p and TN90p during 1400–2005 CE in YRV. The red lines represent the extreme events in Chinese historical documents.



**Figure S11.** Time series of simulated temperature, reconstructed temperature. (a), (b) Simulated 11-year running annual mean  $T_{\text{max}}\text{-anomaly}$ ,  $T_{\text{min}}\text{-anomaly}$  (units:  $^{\circ}\text{C}$ ) over monsoonal China. (c) Reconstructed annual mean temperature anomaly of central-east China by Hao et al. (units:  $^{\circ}\text{C}$ ). Anomalies are calculated related to the reference period (900–1900 CE). Different color lines in (a) and (b) represent individual models and ensemble mean of models. The red lines in Figure S11 (a, b, c) represent the Medieval Climate Anomaly.