

Supplementary Table

Table S1 CMIP5 models used in this study

| Model name | Modeling center |
|--------------|---|
| CanESM2 | Canadian Centre for Climate Modelling and Analysis, Canada |
| CNRM-CM5 | Centre National de Recherches Météorologiques/ Centre Européen de Recherche et Formation Avancée en Calcul Scientifique, France |
| | Commonwealth Scientific and Industrial |
| CSIRO-Mk3.6 | Research Organization/Queensland Climate Change Centre of Excellence, Australia |
| MIROC-ESM | The University of Tokyo and National Institute for Environmental Studies Environmental Studies |
| MPI-ESM-LR | Max Planck Institute for Meteorology, Germany |
| BCC-CSM1-1 | Beijing Climate Center, China Meteorological Administration, China |
| IPSL-CM5A-LR | Institute Pierre-Simon Laplace, France |
| MRI-CGCM3 | Meteorological Research Institute, Japan |

Supplementary Figure

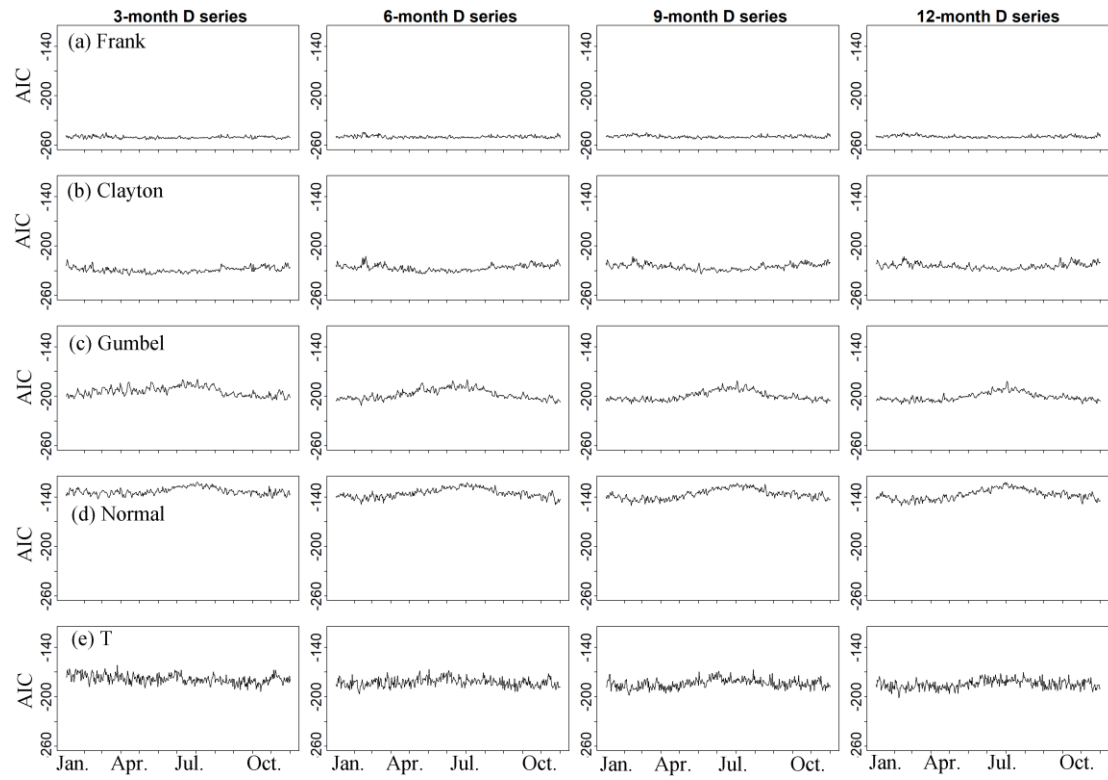


Figure S1 The AIC values for copula selection.

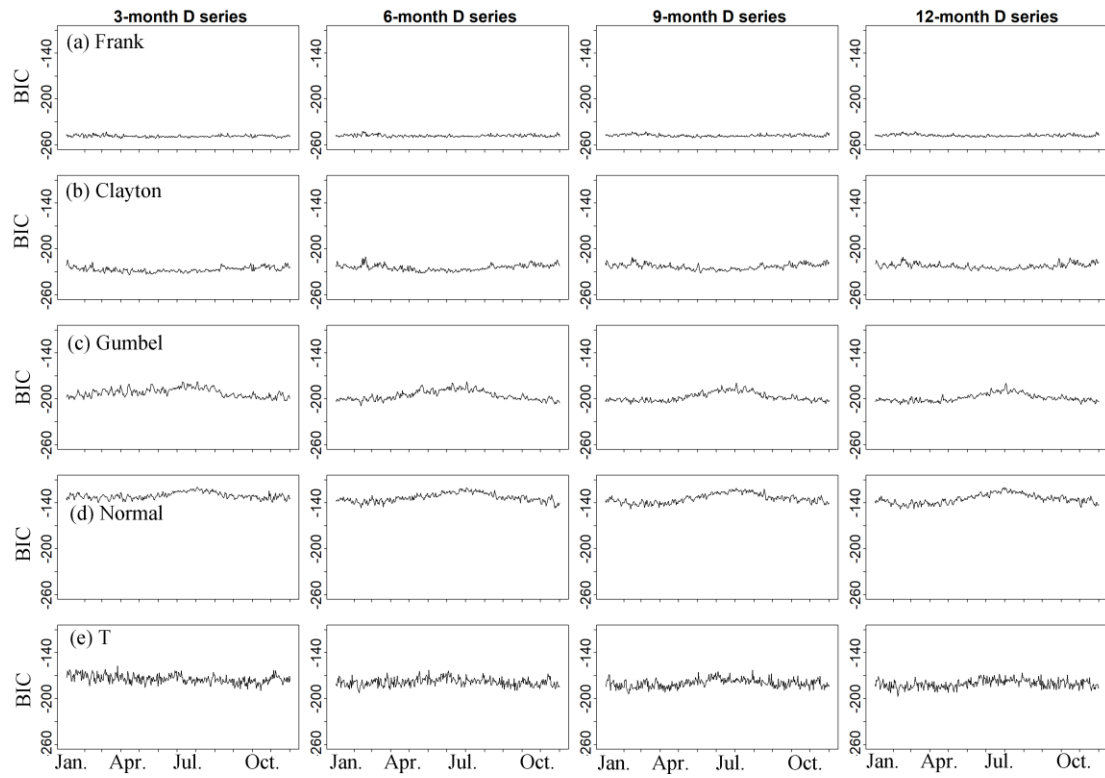


Figure S2 The BIC values for copula selection.

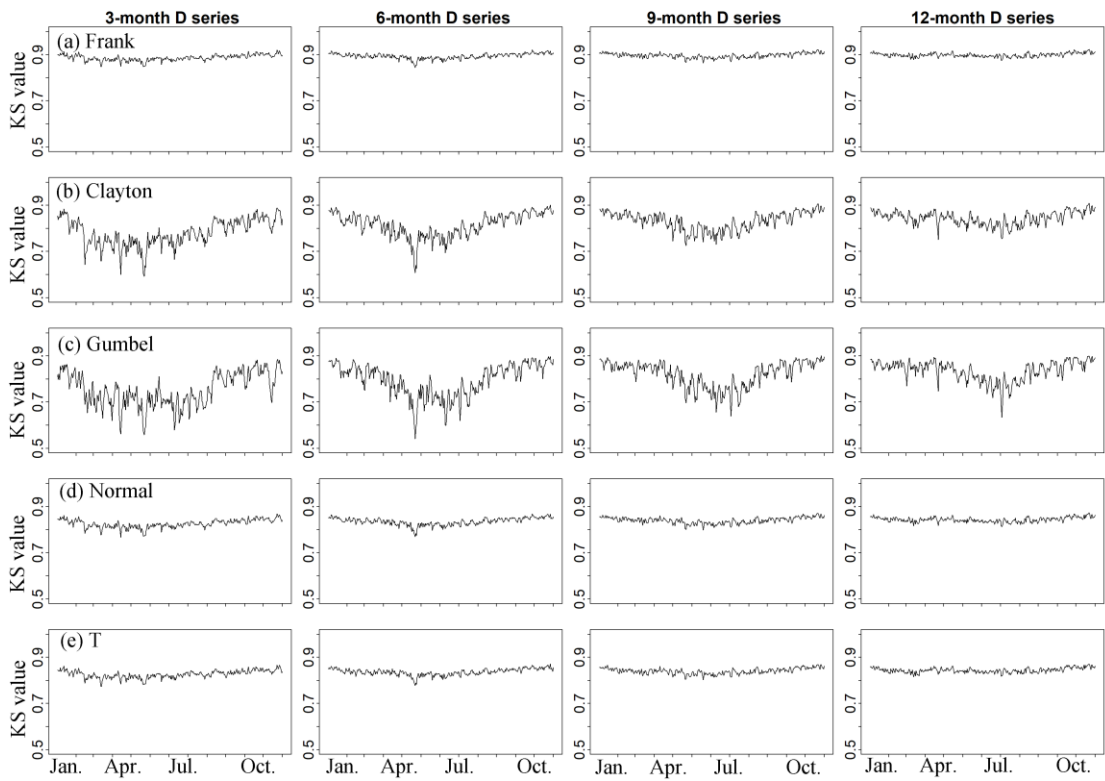


Figure S3 The KS values for copula selection.

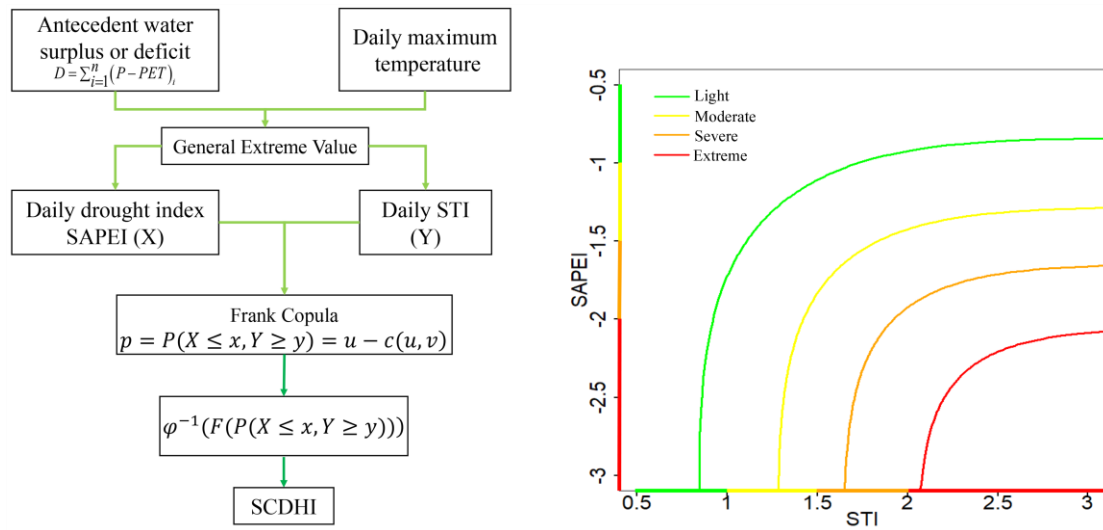


Figure S4 The graphical illustration of the SCDHI construction, and the relation between STI and SAPEI under different compound drought and hot conditions (representing by legend). Different colors in abscissa and ordinate represents different drought or hot conditions (i.e., light, moderate, severe, and extreme). The isolines are calculated from a specific calendar day, using the fitted Frank Copula with the parameter being -1.31.

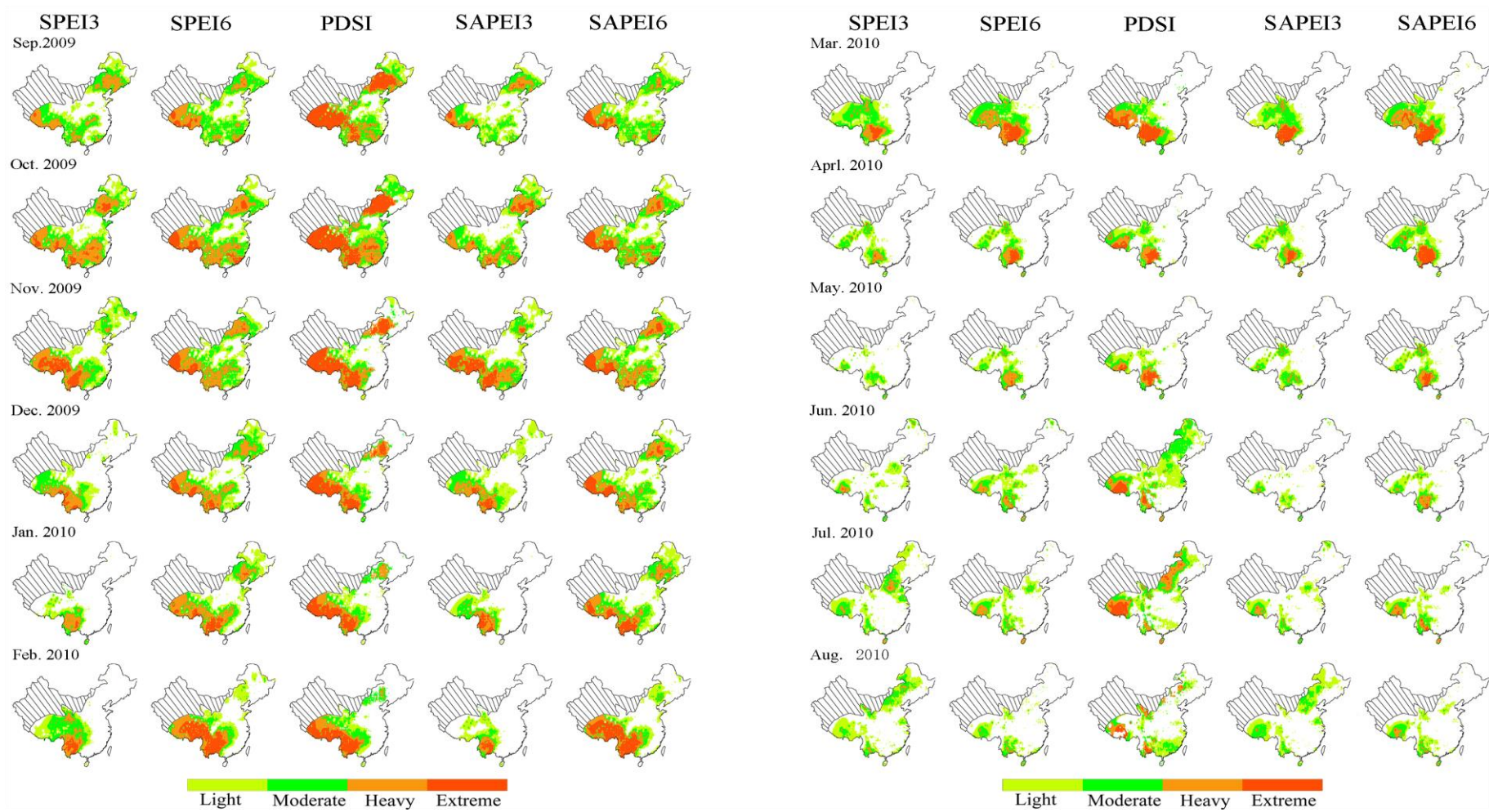


Figure S5 The monthly evolution of the 2009/10 drought in China.

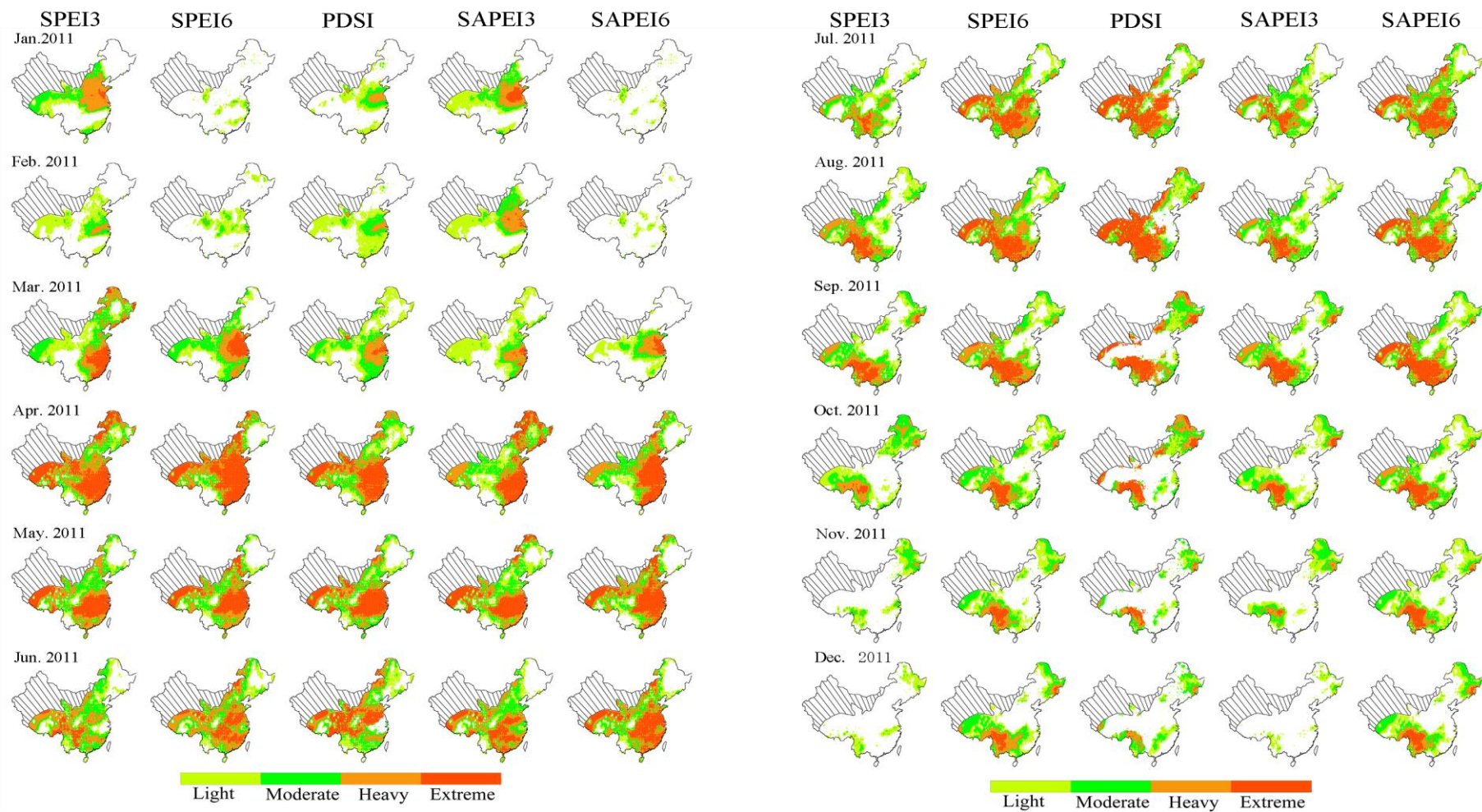


Figure S6 The monthly evolution of the 2011 drought in China.

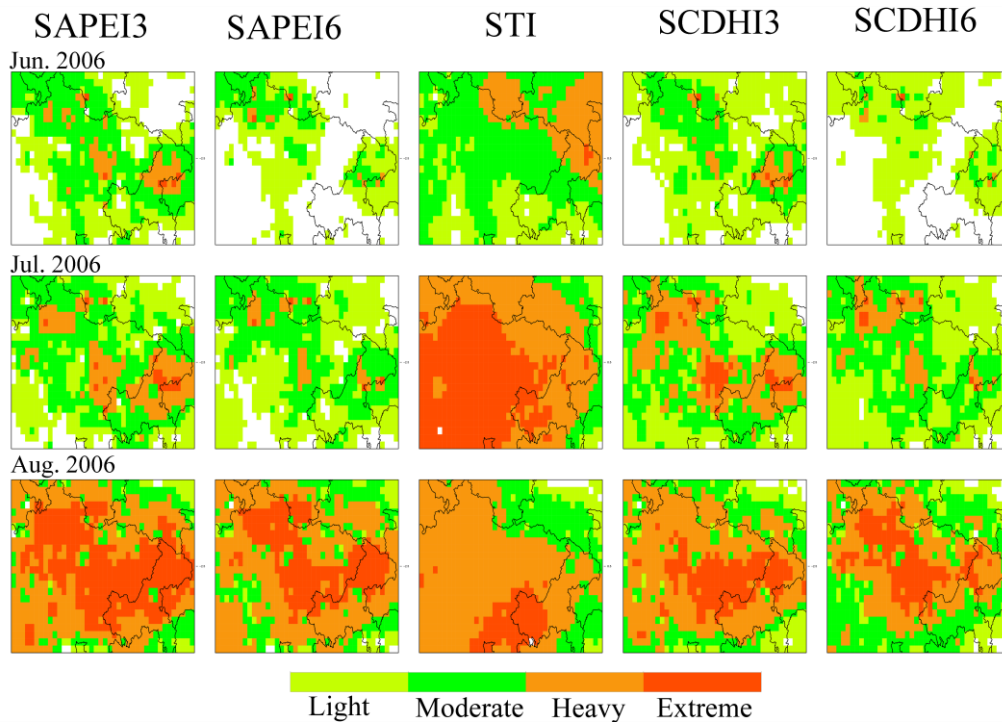


Figure S7 The monthly evolution of the compound dry and hot event in Sichuan-Chongqing region in 2006.

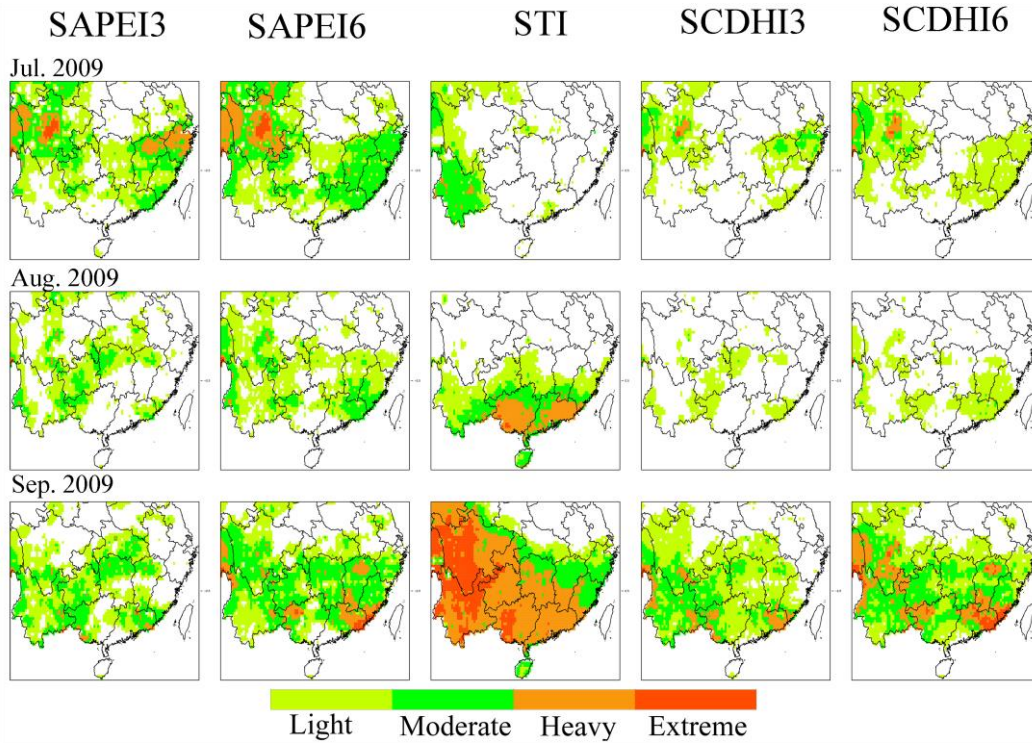


Figure S8 The monthly evolution of the compound dry and hot event in southern China in 2009.

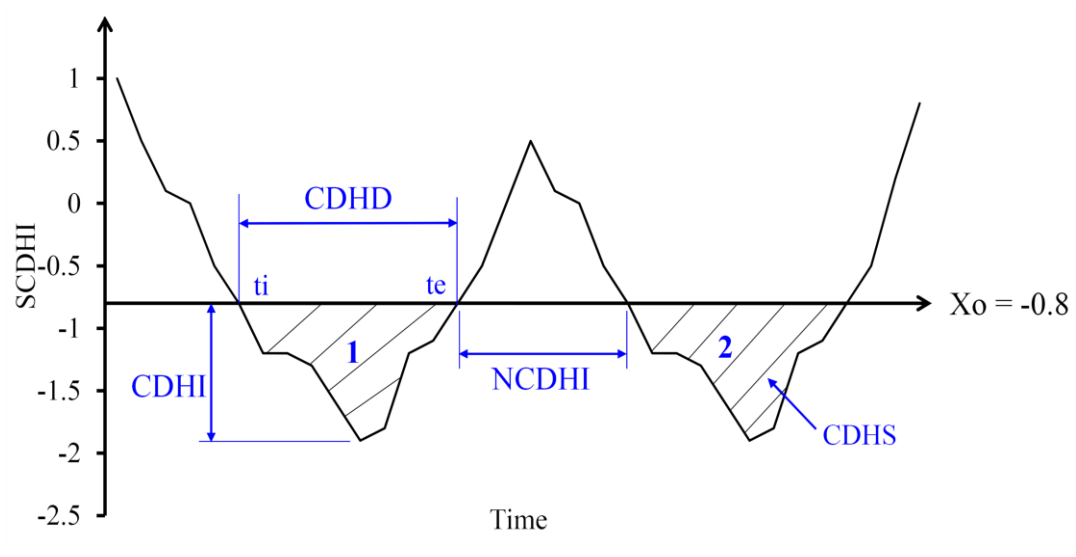


Figure S9 Definition sketch of CDHE characteristics showing two CHDEs (labeled as 1 and 2), on the basis of Run Theory. Note: X_0 ; Truncation level, CDHD; Compound dry and hot duration, CDHS; Compound dry and hot severity, CDHI; Compound dry and hot intensity, NCDHC; Non compound dry and hot condition, t_i ; initiation time, t_e ; termination time.