



*Supplement of*

## **A process-oriented analysis of the summertime diurnal cycle of precipitation and diabatic heating over China in three reanalyses**

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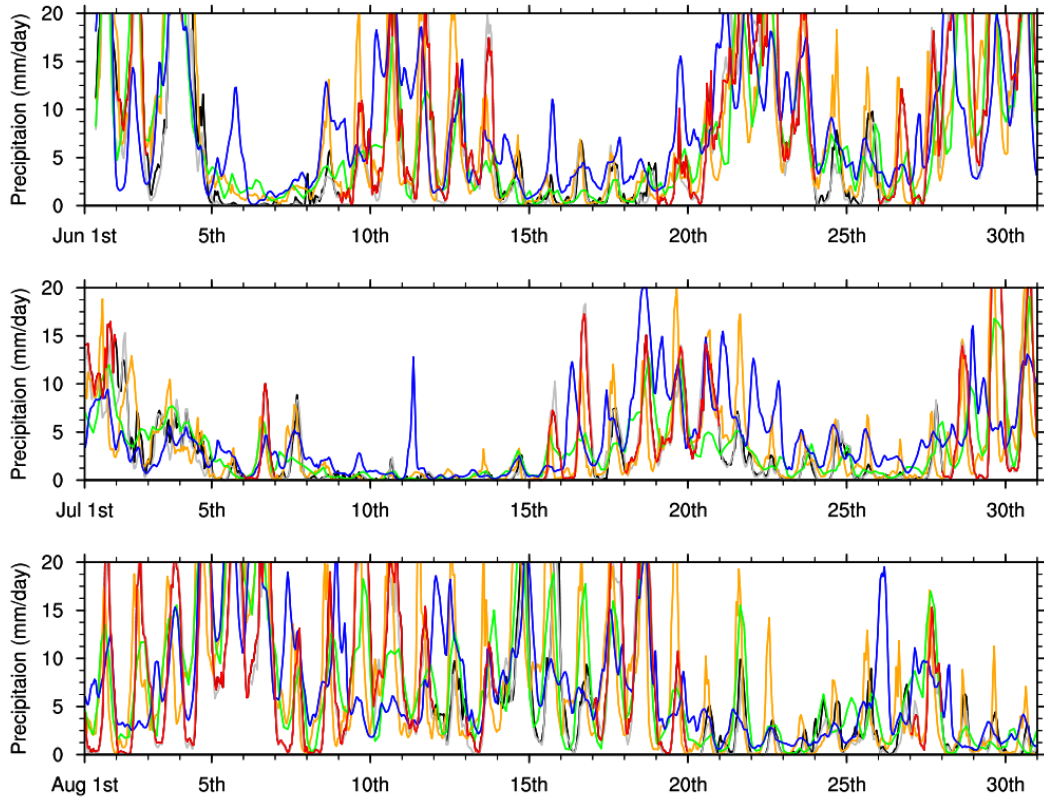


Figure S 1 Precipitation evolution of IMERG (black), CMORPH (gray), ERA5 (orange), JRA-55 (green) and MERRA-2 (blue) over SECN. Red lines denote the selected observation events.

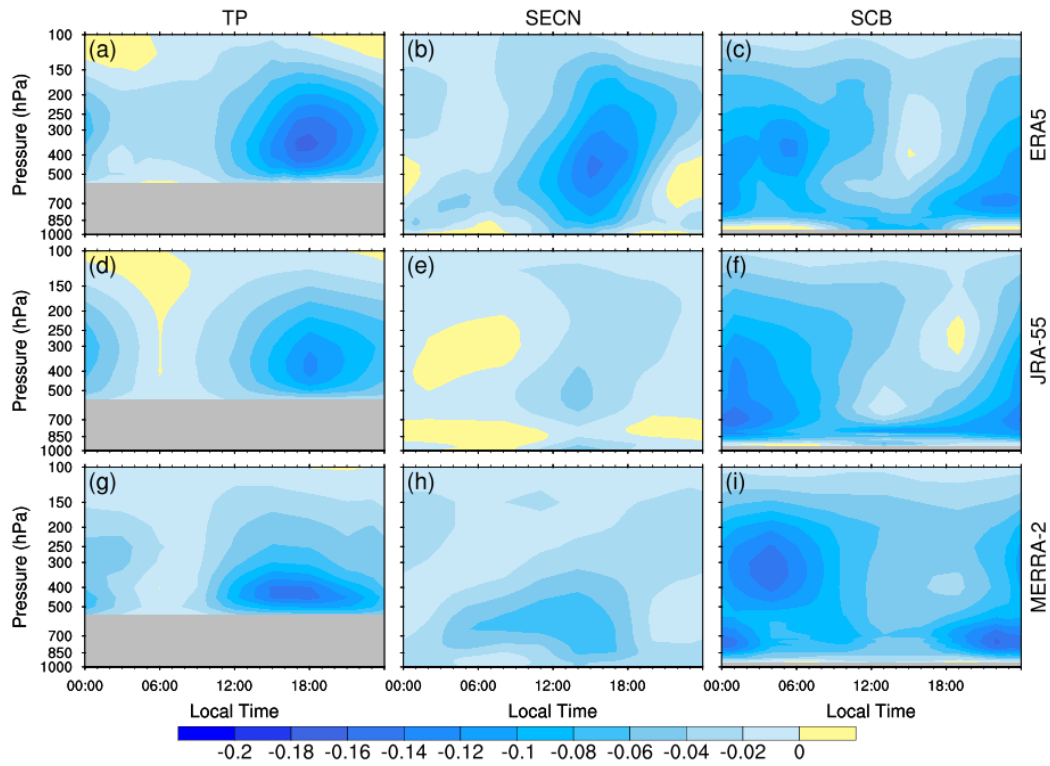


Figure S 2 Diurnal variation of vertical velocity over TP (left), SECN (middle) and SCB (right) from ERA5 (top), JRA-55 (middle) and MERRA-2 (bottom) averaged over observation events. Units:  $\text{Pa s}^{-1}$ .

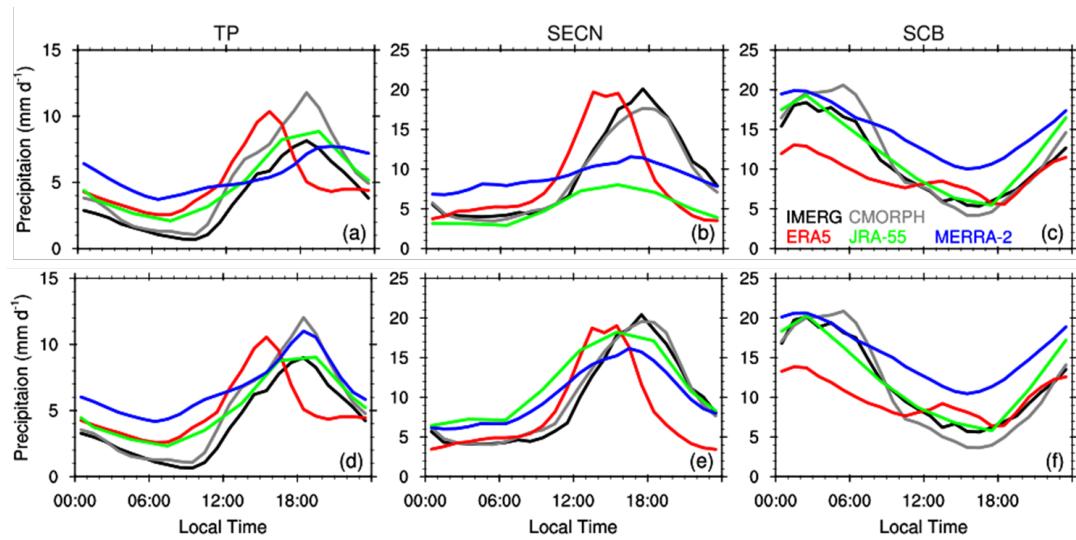


Figure S 3 Case-composite diurnal variations of precipitation over (a, d) TP, (b, e) SECN and (c, f) SCB. **Top and bottom rows are derived from observation events and the original case, respectively.**

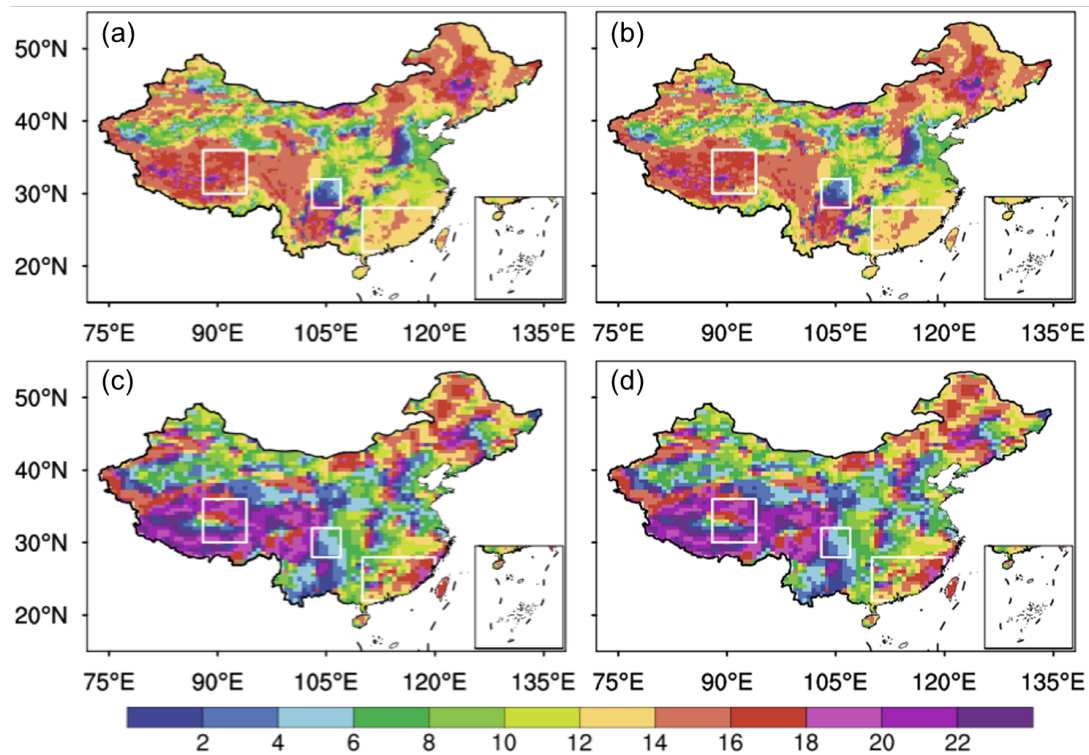


Figure S 4 Diurnal phase (local solar time, LST; the same hereafter) of total precipitation averaged over June–July–August (JJA) 2019–2023 for China from (a, b) ERA5 and (c, d) MERRA-2. **Left and right columns denote 3-hourly and 1-hourly (original) sampling, respectively.** White boxes mark the three representative regions: the Tibetan Plateau (TP, 30°–36°N, 88°–94°E), southeastern China (SECN, 22°–28°N, 110°–120°E), and the Sichuan Basin (SCB, 28°–32°N, 103°–107°E).

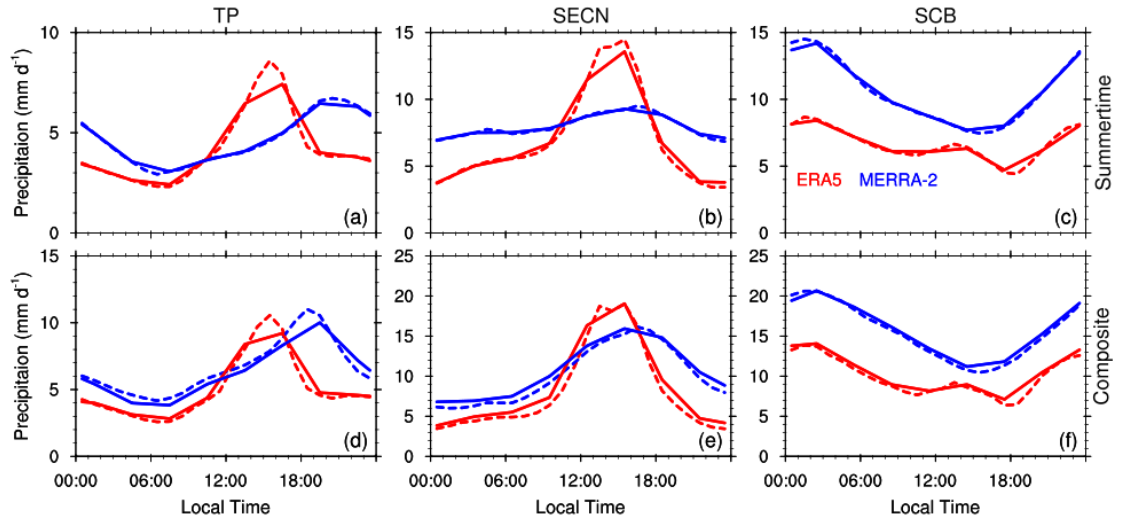


Figure S 5 Five-year JJA-averaged (top row) and case-composite (bottom row) diurnal variations of precipitation over TP (left), SECN (middle) and SCB (right). Solid and dashed lines denote down-sampled (3-hourly) and original (1-hourly) results, respectively.