

Figure S1. Pettitt change-point test of annual mean daily maximum temperature over mainland China.

Table S1. Linear trend slopes of the third phase under different starting years.

| Time series | Slope ($^{\circ}\text{C yr}^{-1}$) | Time series | Slope ($^{\circ}\text{C yr}^{-1}$) |
|-------------|--------------------------------------|-------------|--------------------------------------|
| 2015–2024 | 0.07 | 2009–2024 | 0.07 |
| 2014–2024 | 0.07 | 2008–2024 | 0.06 |
| 2013–2024 | 0.06 | 2007–2024 | 0.04 |
| 2012–2024 | 0.09 | 2006–2024 | 0.03 |
| 2011–2024 | 0.09 | 2005–2024 | 0.04 |
| 2010–2024 | 0.08 | 2004–2024 | 0.03 |

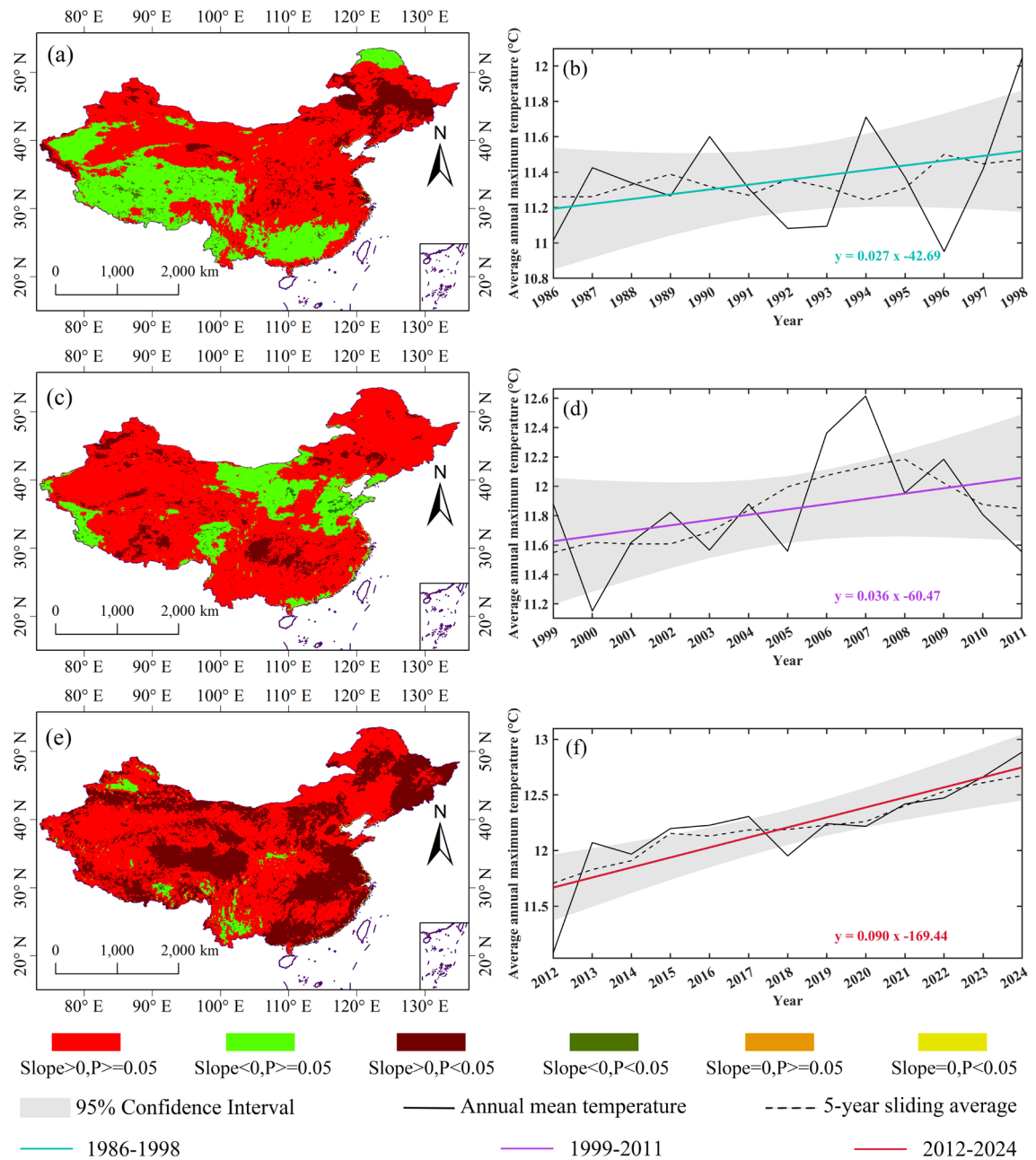


Figure S2. Spatial distribution of warming trends in annual mean daily maximum temperature across mainland China.

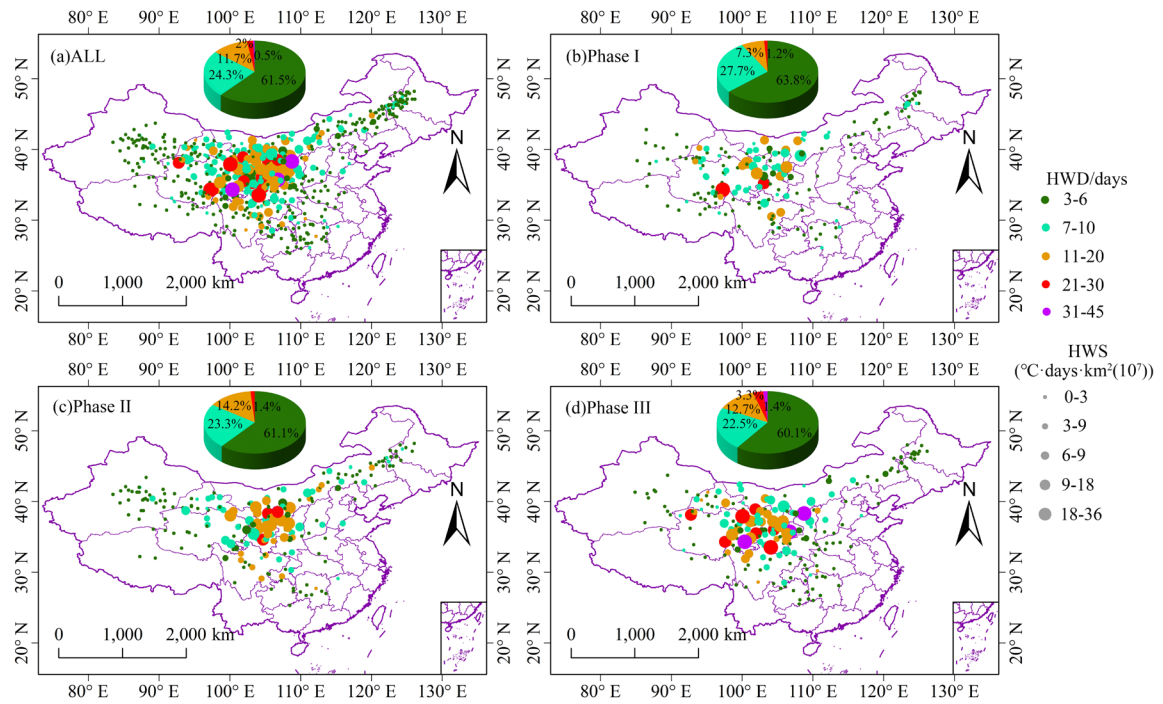


Figure S3. Spatial distribution of heatwave event centroids across mainland China for all events and each phase, with colour indicating HWD and symbol size indicating HWS.

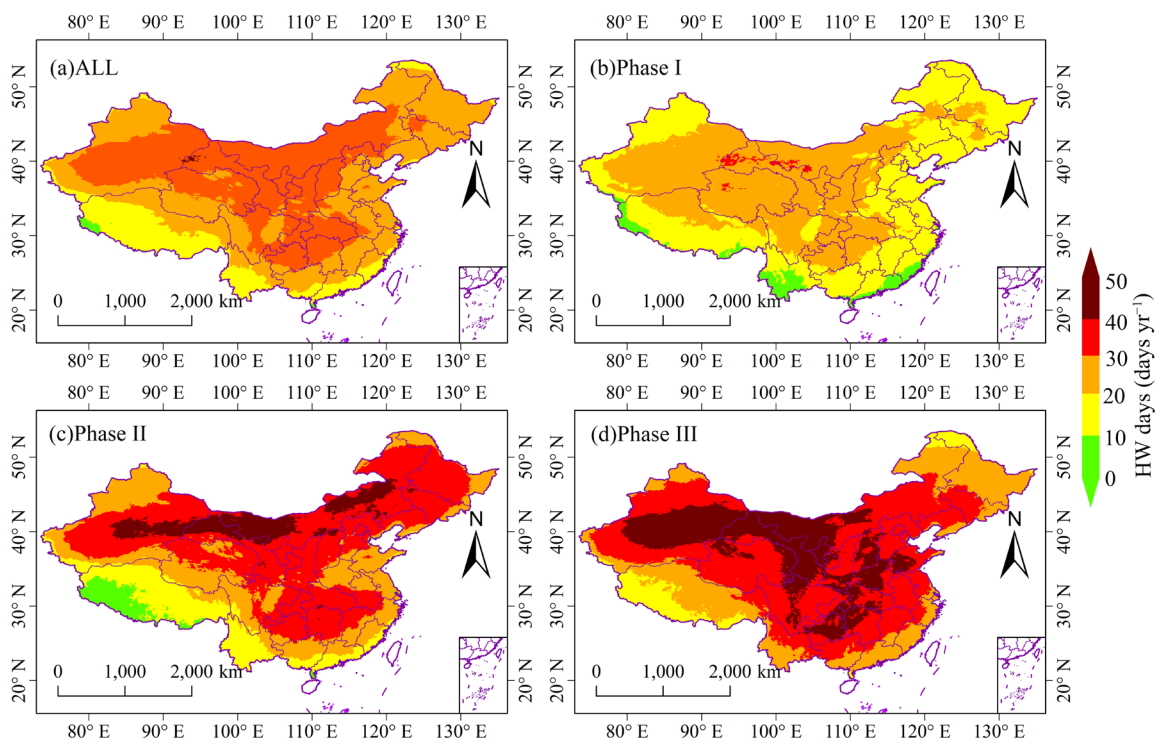


Figure S4. Average number of heatwave days per year in mainland China during different phases.

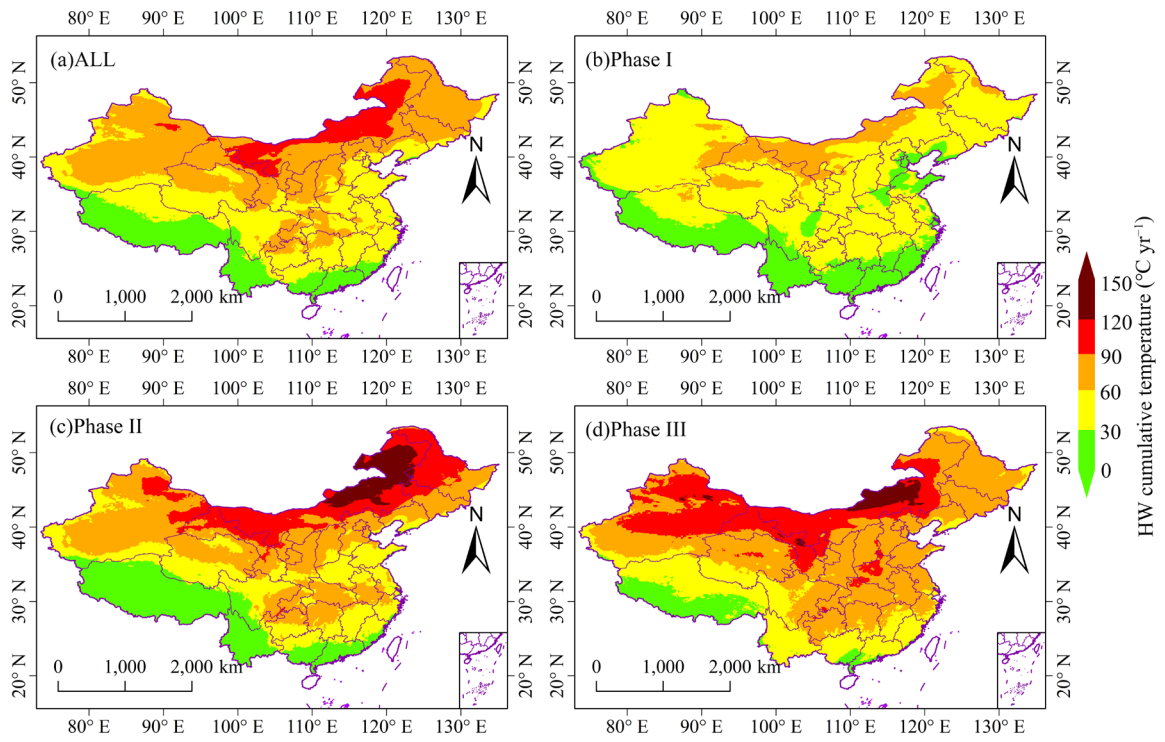


Figure S5. Average annual cumulative temperature of heatwaves in mainland China during different phases.

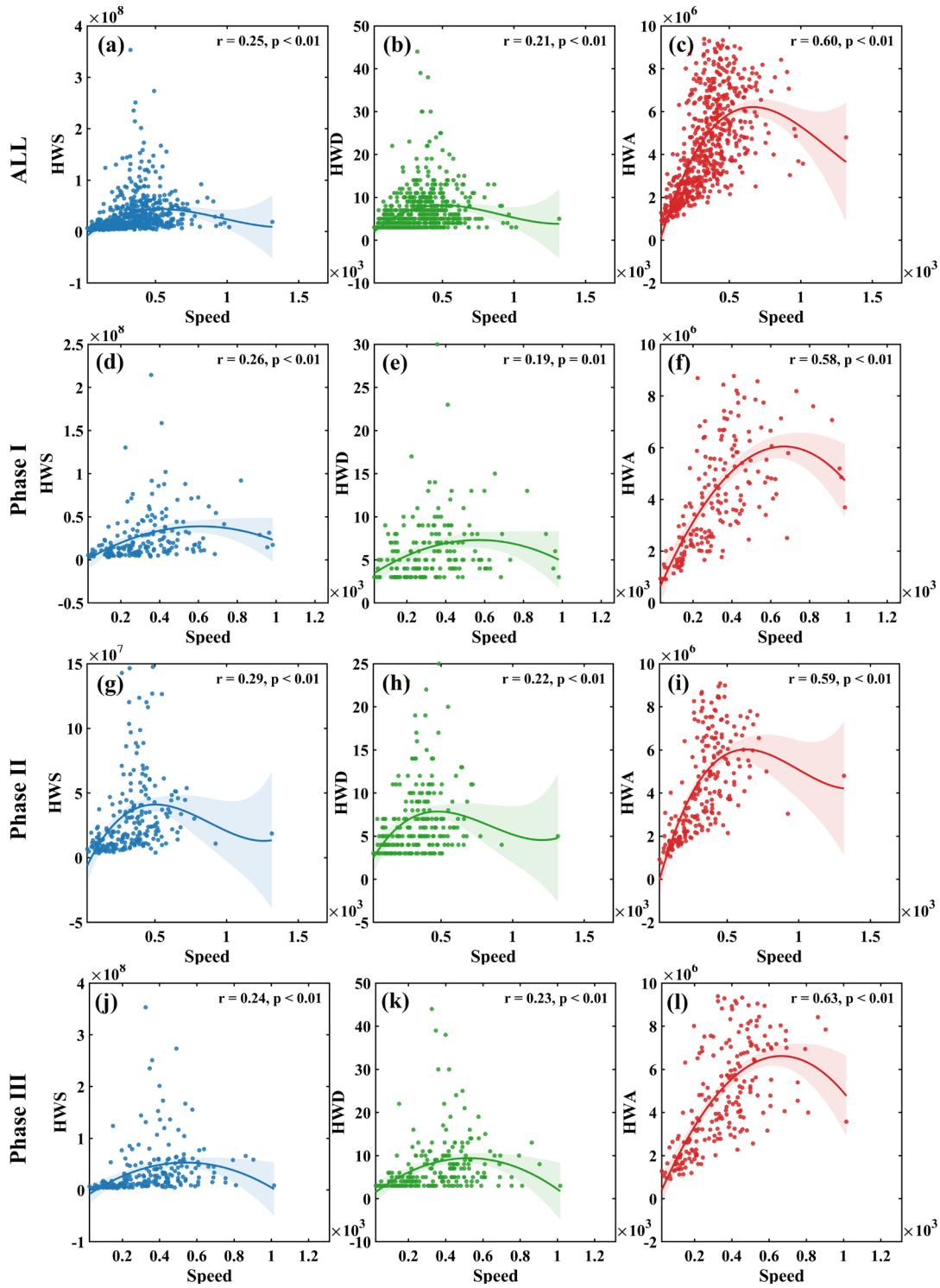


Figure S6. Relationships between Speed and HWD, HWS, and HWA across different phases from 1986 to 2024.

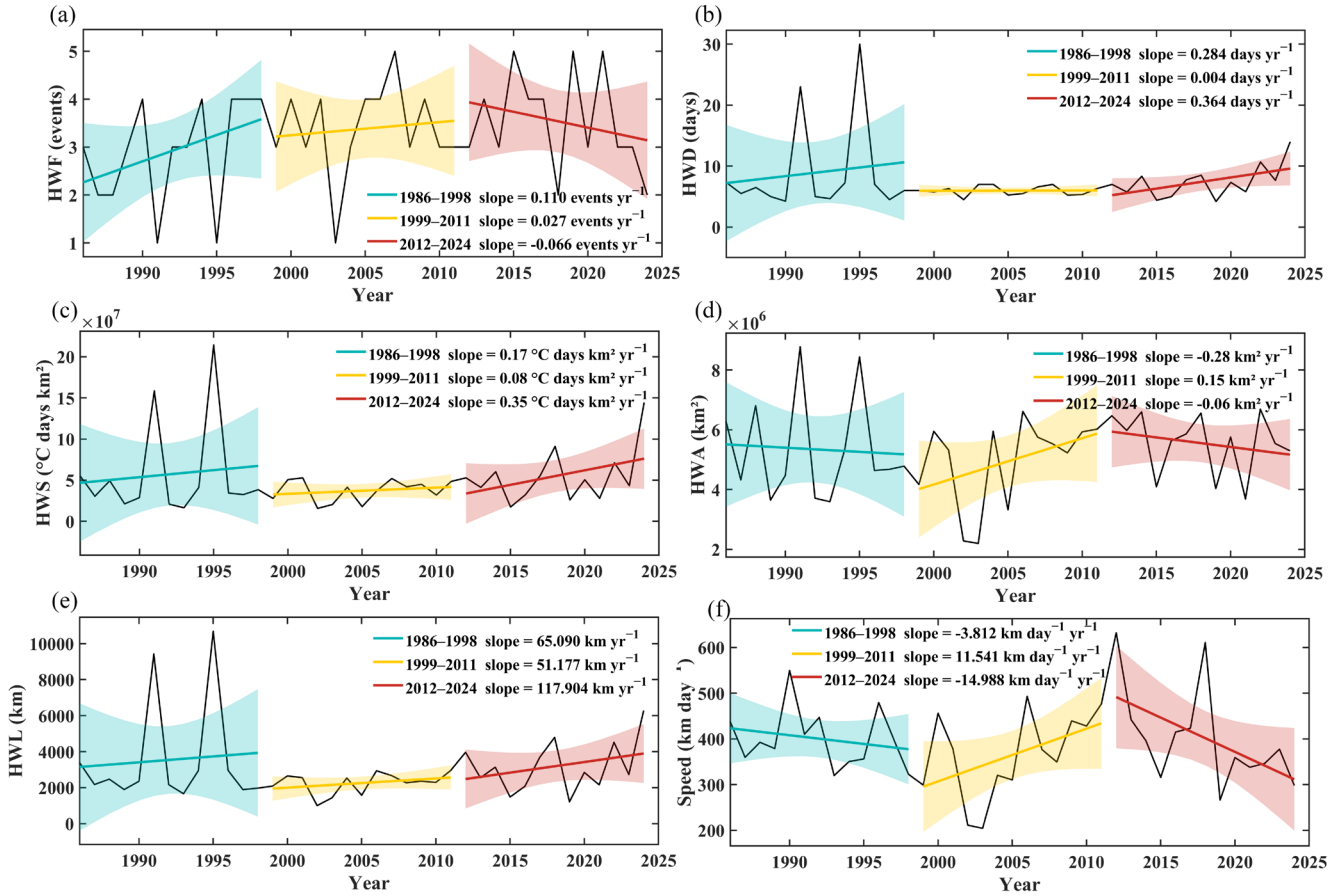


Figure S7. Time series of regional mean heatwave characteristics in May across the three phases from 1986 to 2024.

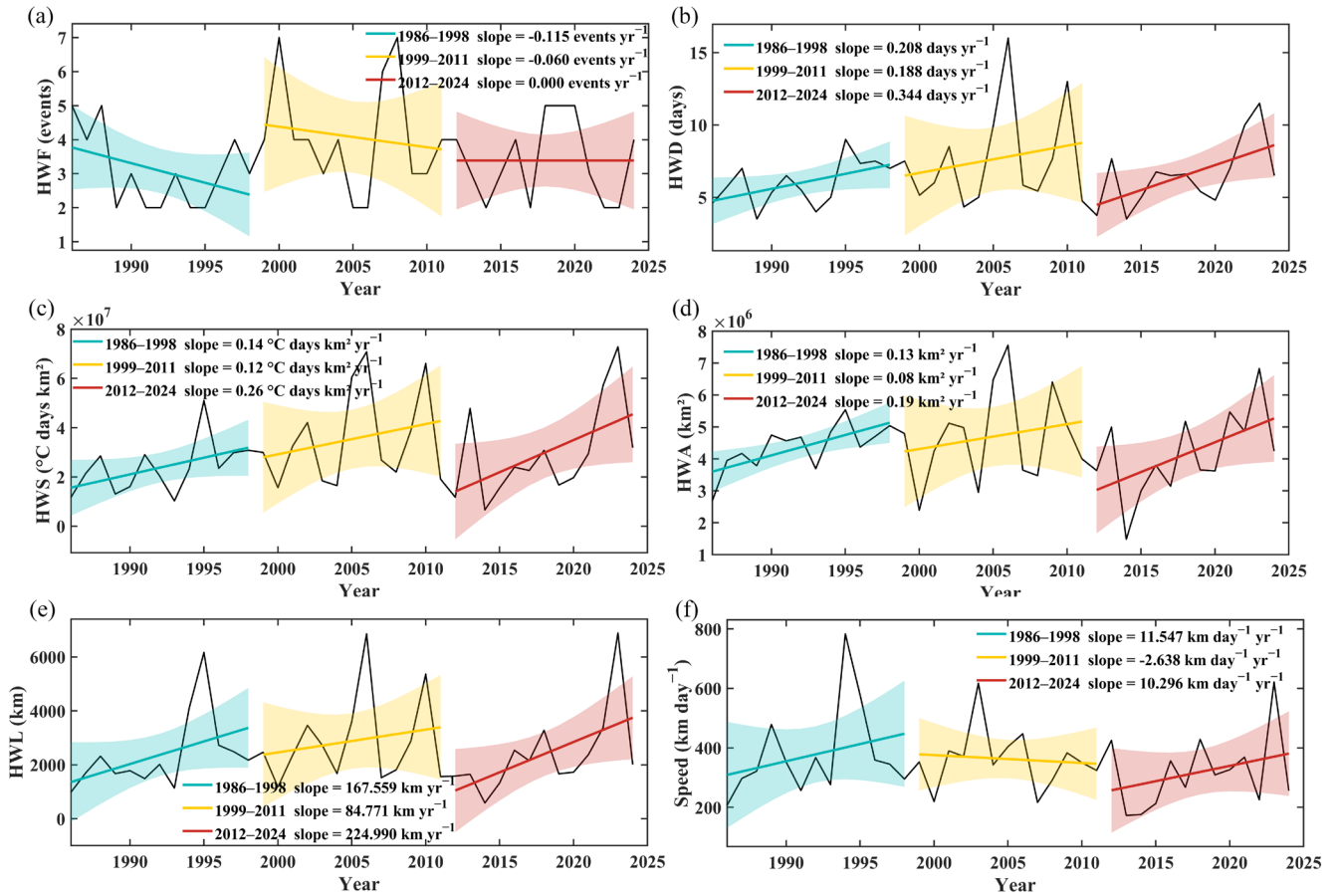


Figure S8. Time series of regional mean heatwave characteristics in June across the three phases from 1986 to 2024.

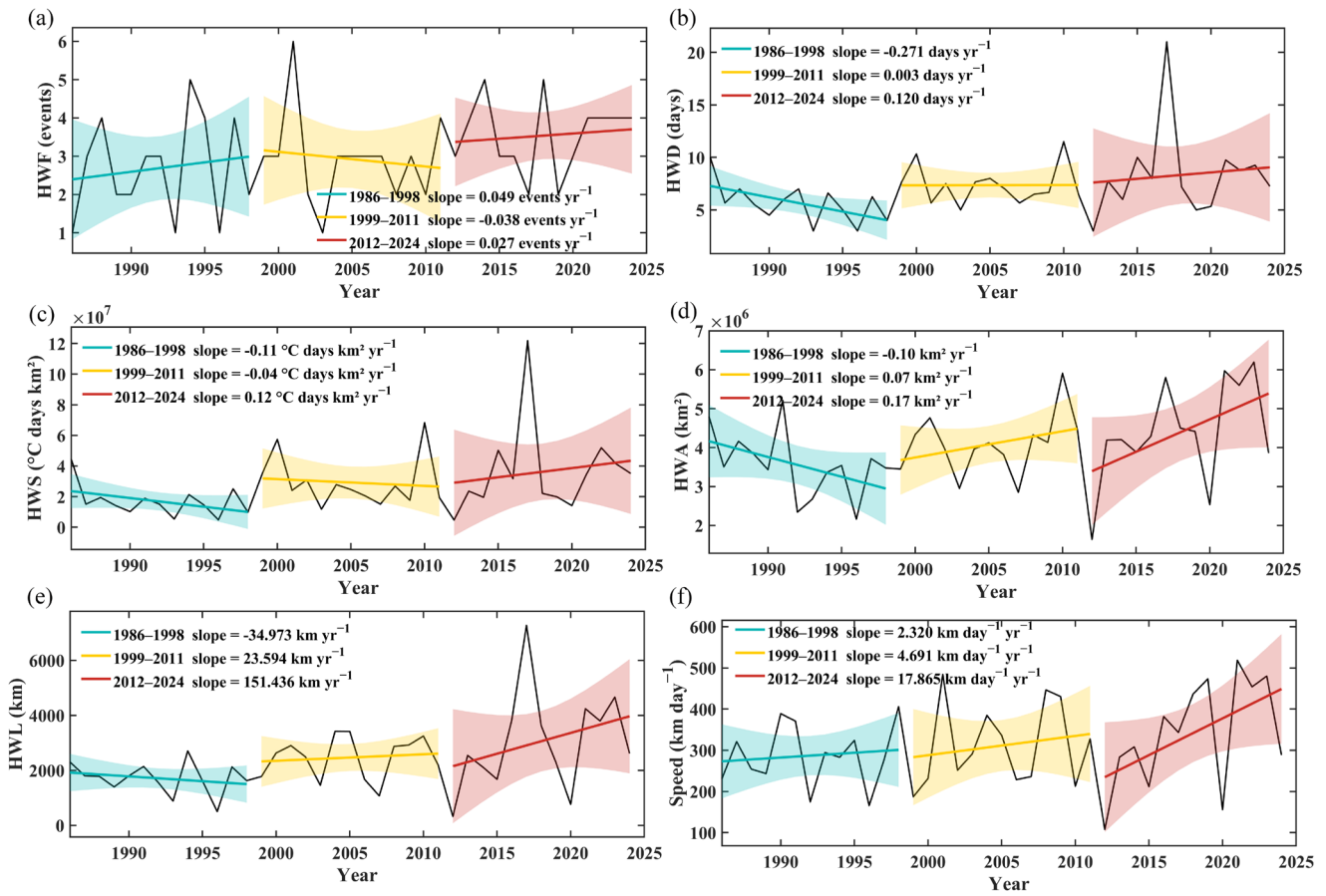


Figure S9. Time series of regional mean heatwave characteristics in July across the three phases from 1986 to 2024.

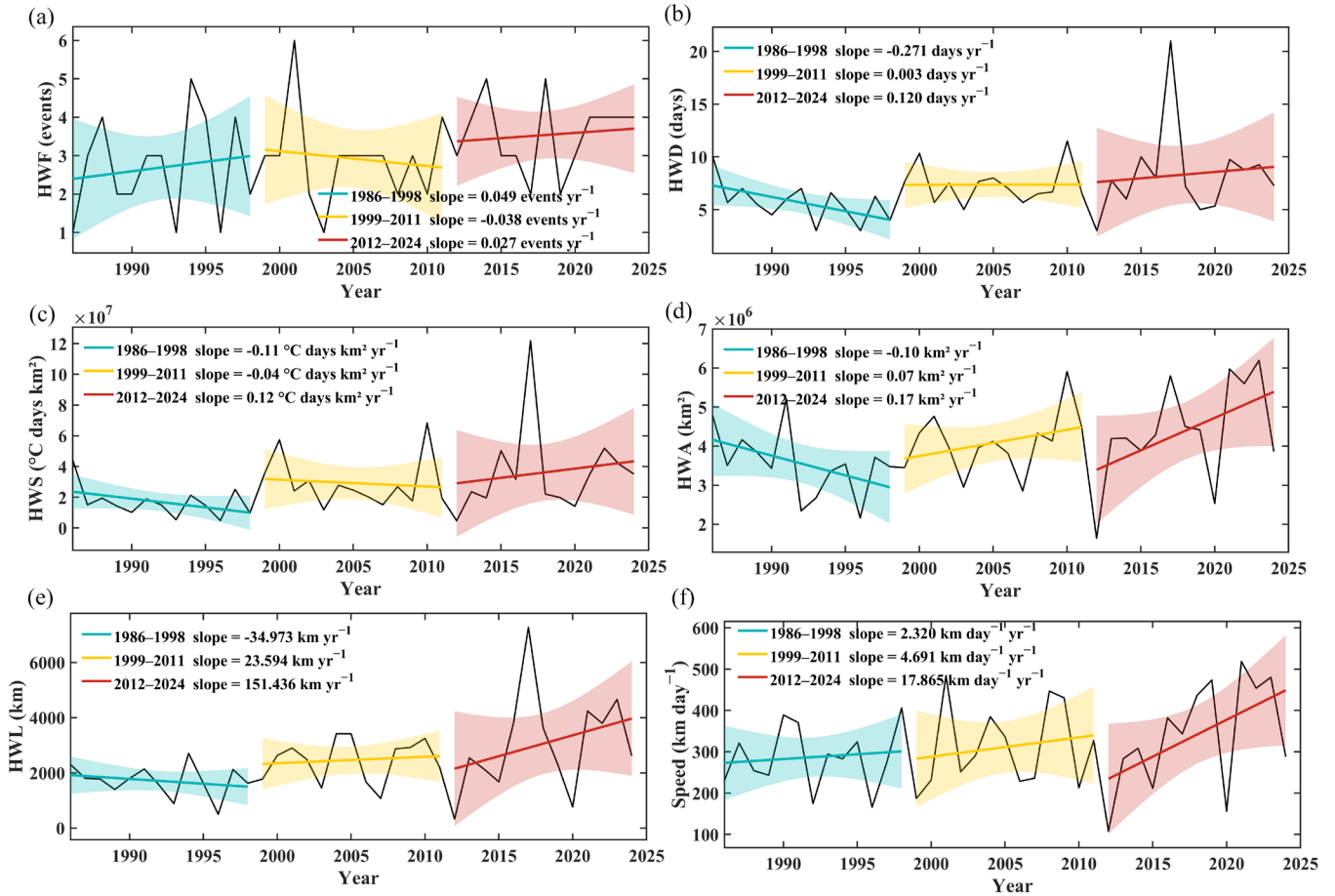


Figure S10. Time series of regional mean heatwave characteristics in August across the three phases from 1986 to 2024.

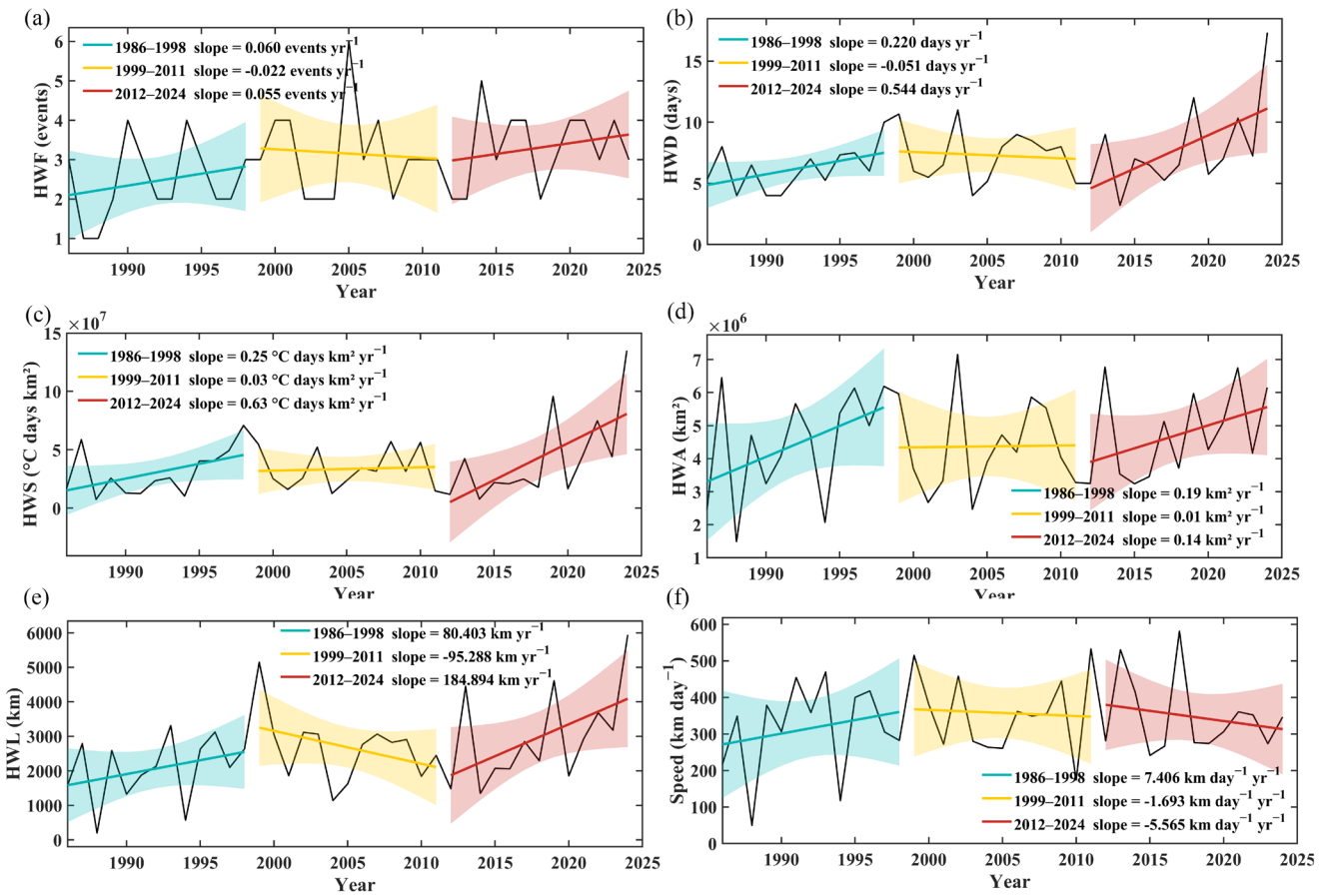


Figure S11. Time series of regional mean heatwave characteristics in September across the three phases from 1986 to 2024.

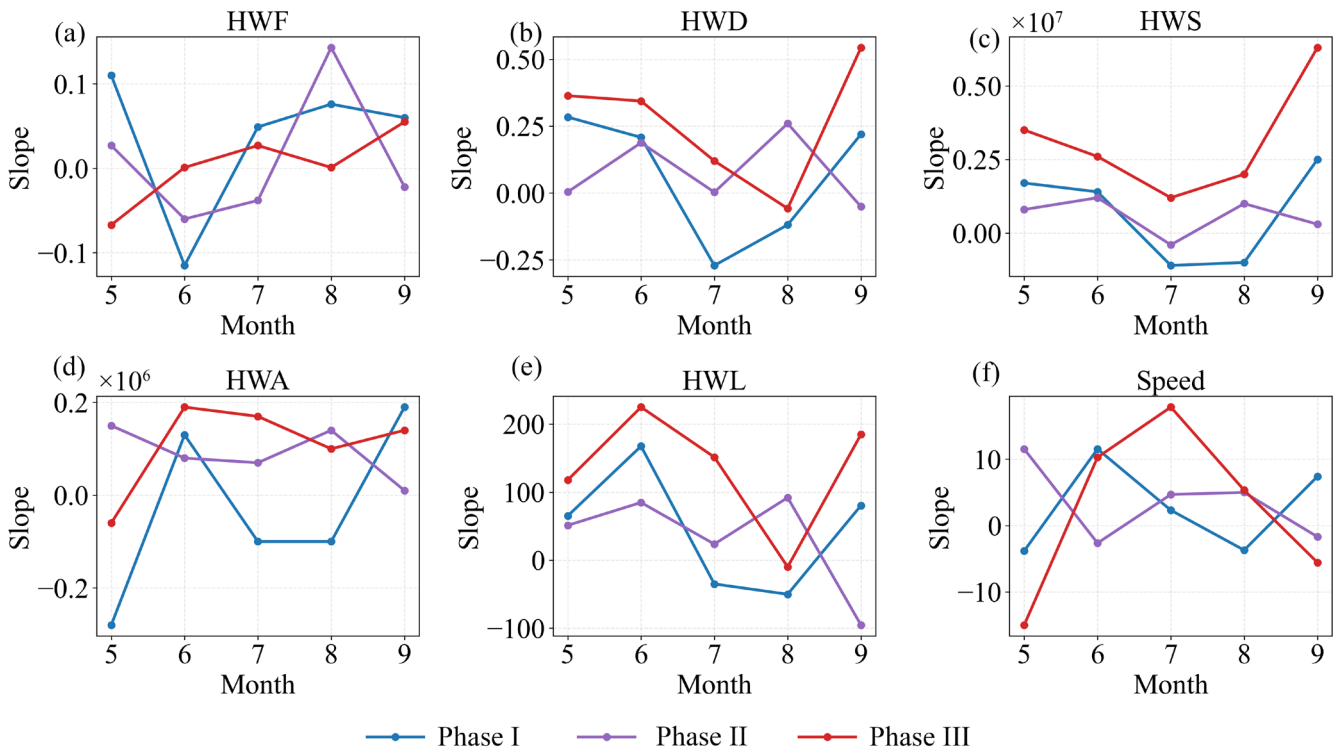
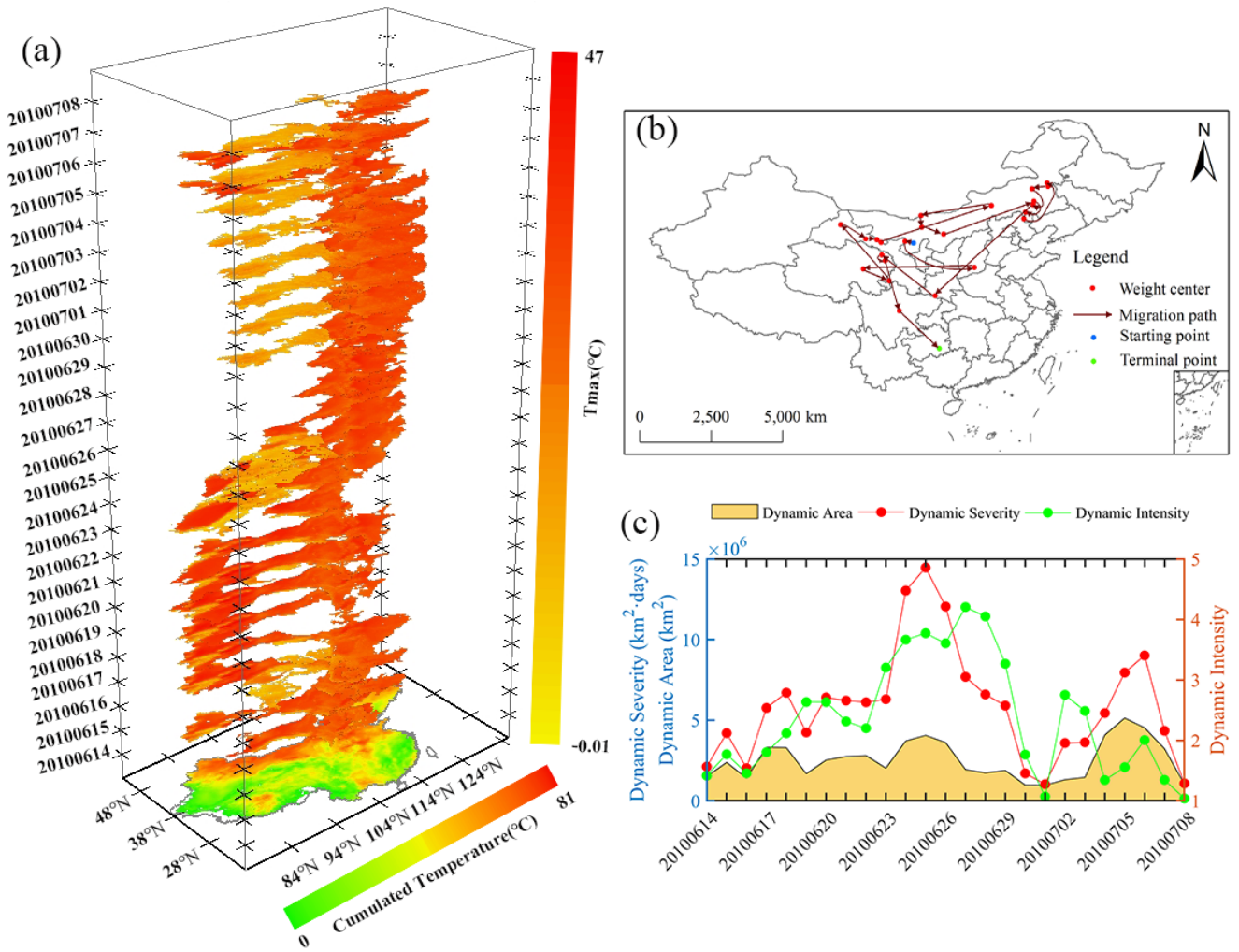


Figure S12. Monthly variations in trend slopes of heatwave characteristics from May to September across different phases.



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Figure S13. Representative 3D heatwave event with the highest HWS during Phase II (14 June–8 July 2010).

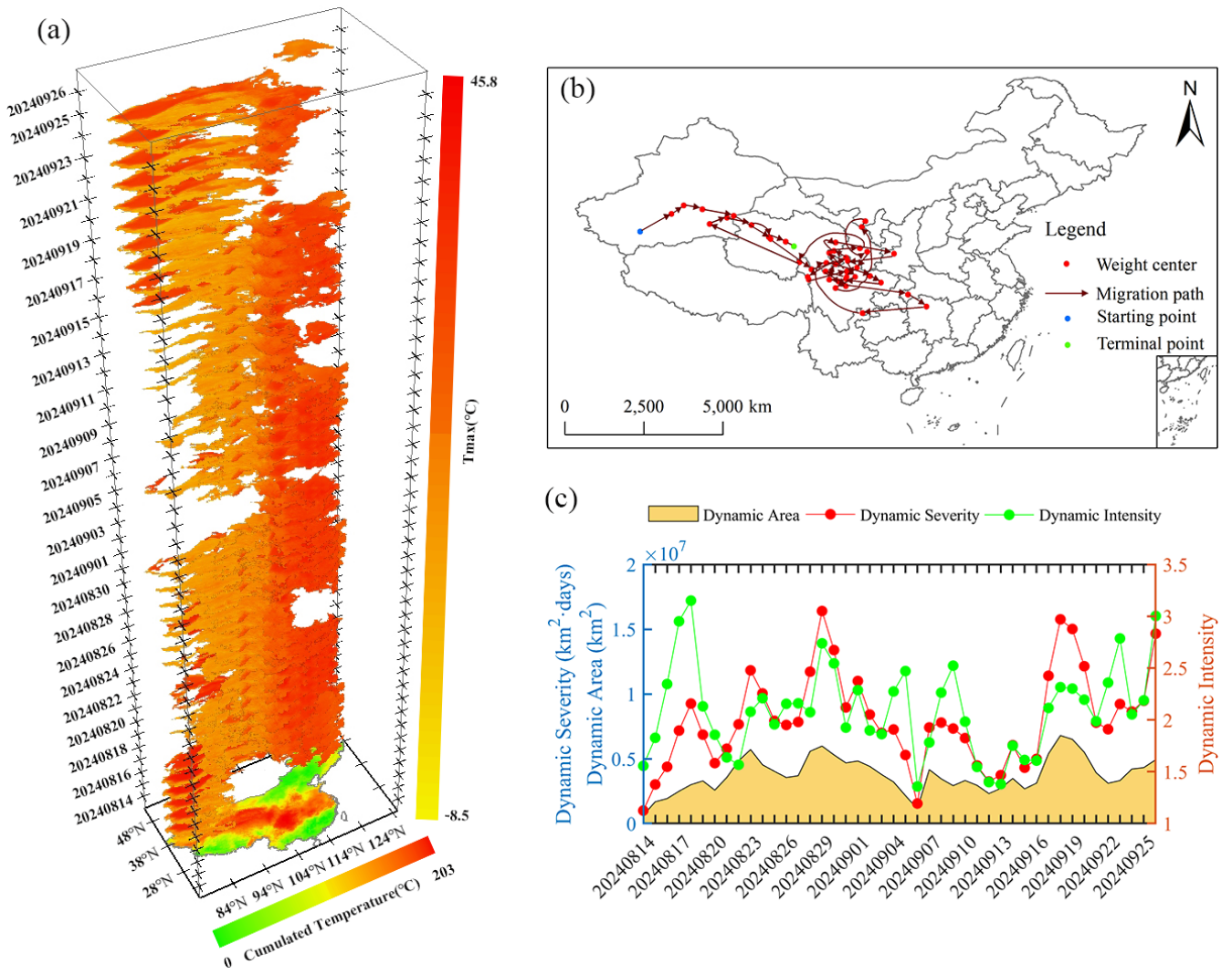


Figure S14. Representative 3D heatwave event with the highest HWS during Phase III (14 August–26 September 2024).