

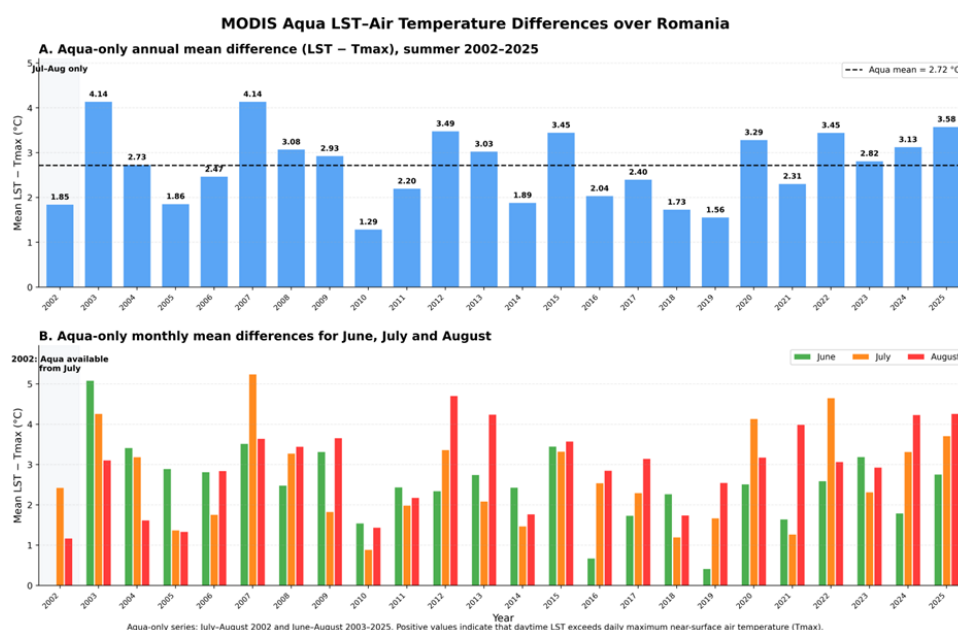


Figure S1. Temporal variability in the difference between MODIS Aqua daytime land surface temperature (LST) and daily maximum near-surface air temperature (Tmax) over Romania during summer. (a) Annual mean LST–Tmax difference for July–August 2002 and June–August 2003–2025; the dashed line indicates the overall Aqua mean difference of 2.72°C. (b) Monthly mean LST–Tmax differences for June, July, and August. Positive values indicate that daytime MODIS Aqua LST exceeded daily maximum near-surface air temperature.

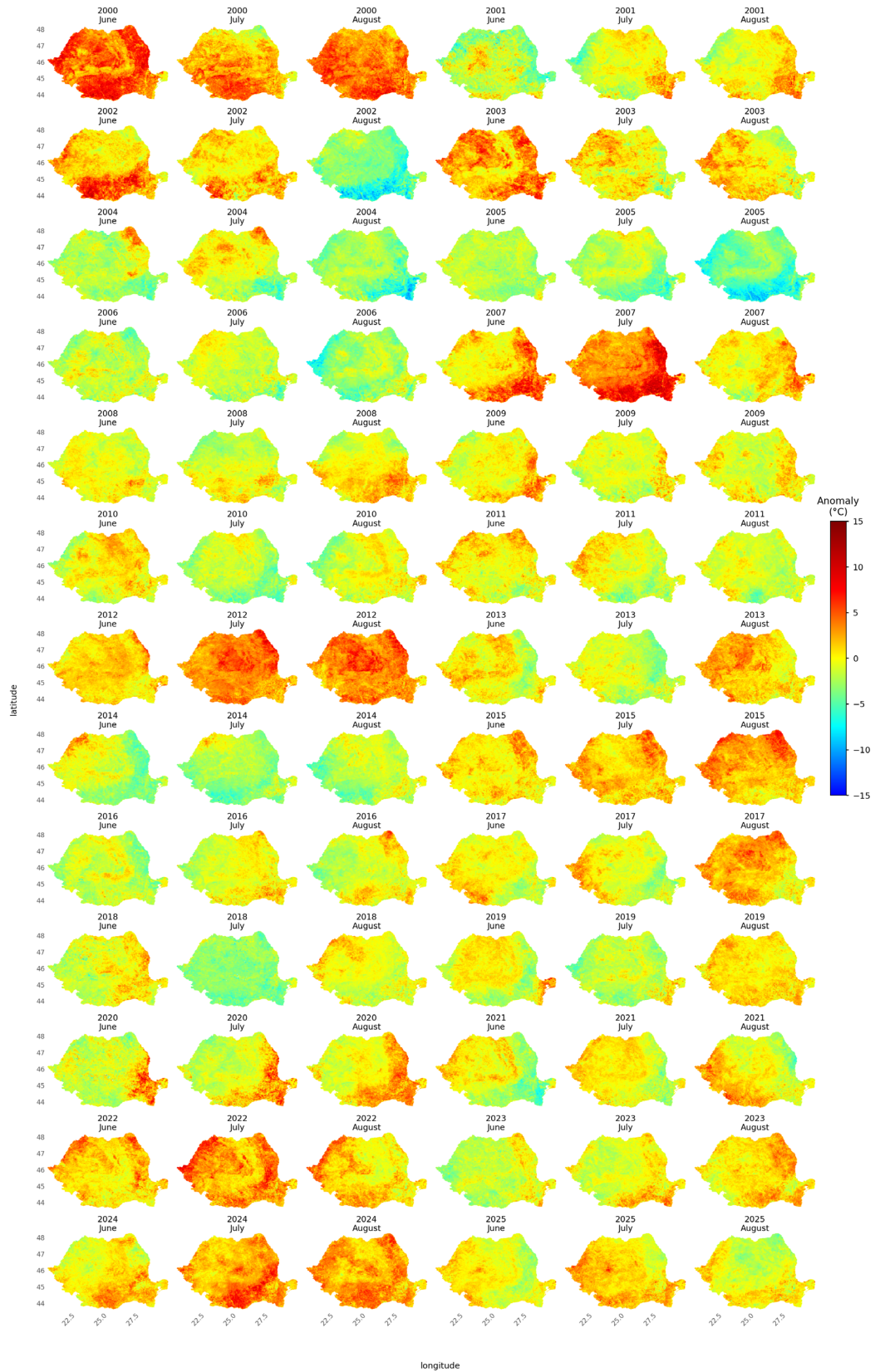


Figure S2. Spatial distribution of monthly MODIS daytime LST anomalies in Romania during summer (JJA), derived separately from Terra (JJA 2000–2025) and Aqua (July–August 2002 and JJA 2003–2025) observations. Anomalies were calculated independently for each sensor and calendar month using the corresponding sensor-specific monthly climatology.

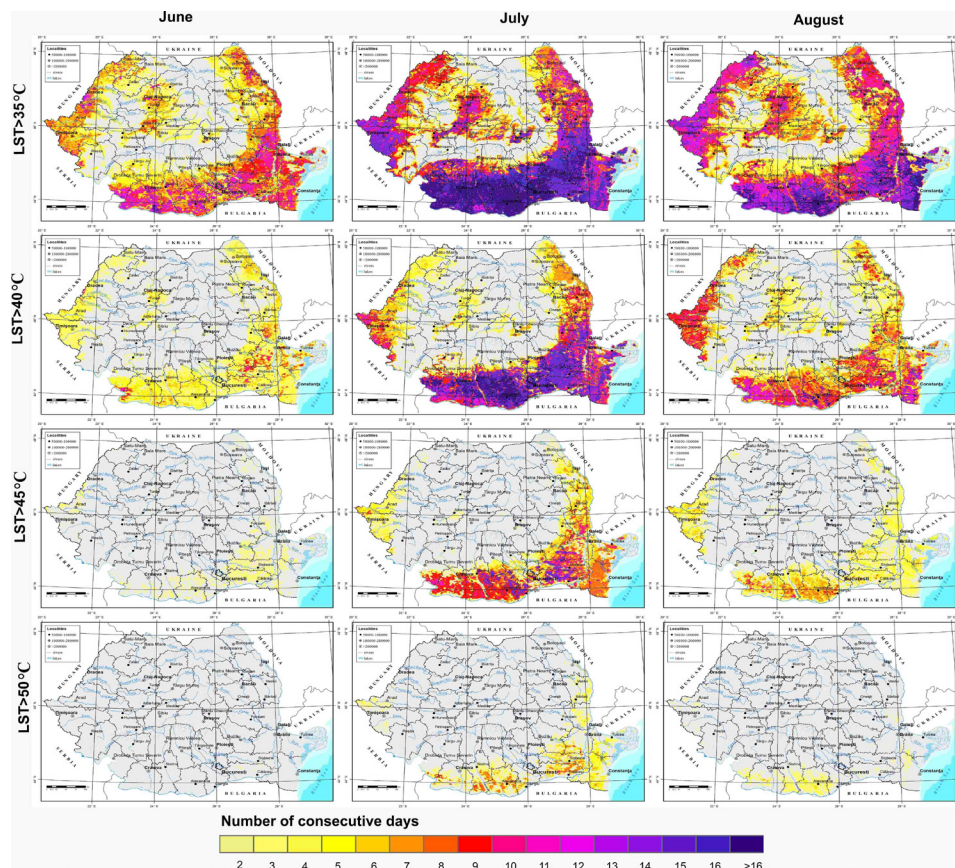


Figure S3 . Number of Consecutive Days by Month and LST Threshold

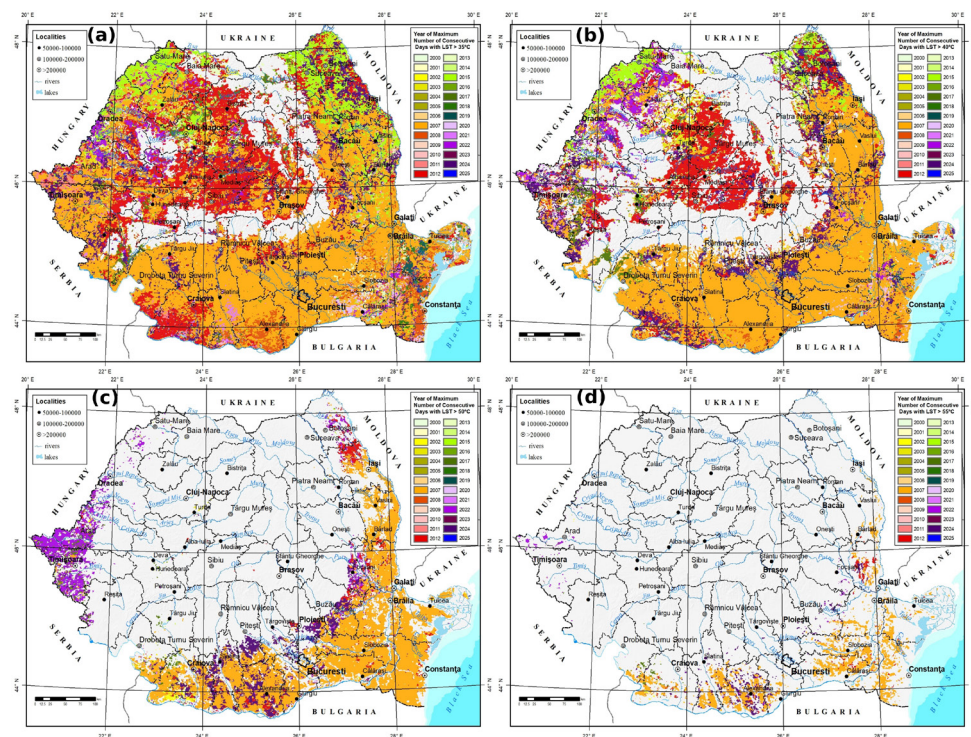


Figure S4. Year of the maximum number of consecutive days with (a) maximum LST >35°C; (b) LST >40°C; (c) LST >50°C; (d) LST >55°C

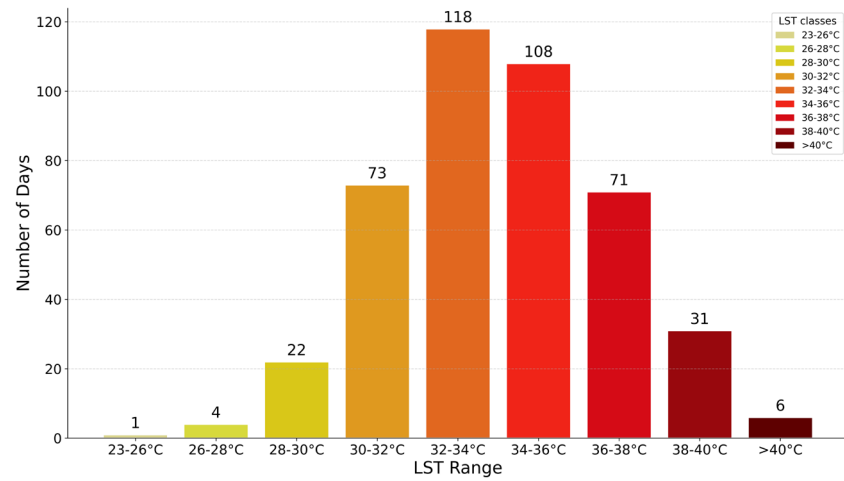


Figure S5. Number of Heatwave Days by LST Range

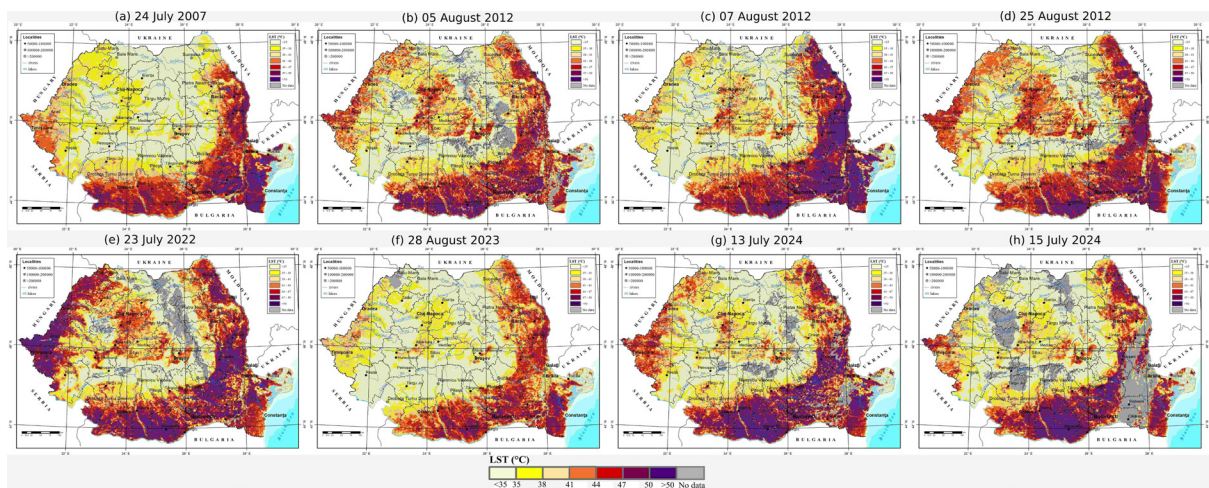


Figure S6. Representative examples of extreme land surface temperature (LST) during major heatwave events in Romania (2000–2025), 10:30–12:10 UTC

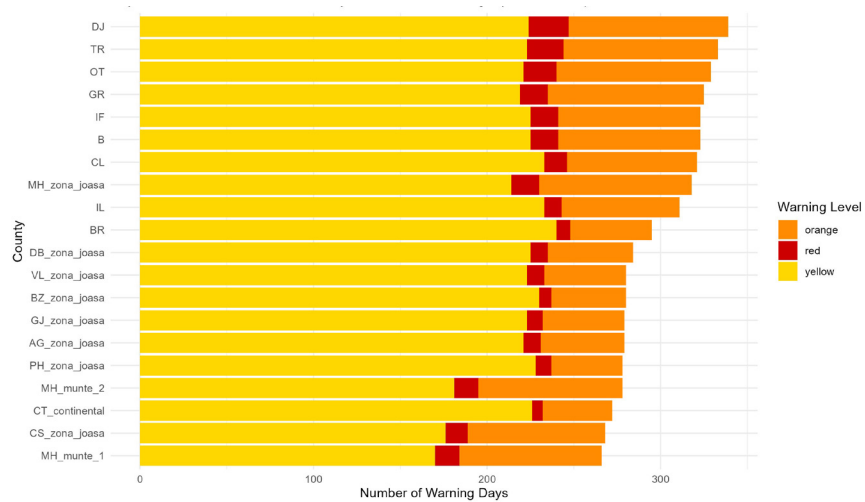


Figure S7. Top 20 most affected counties by heatwaves warnings (2007–2025)

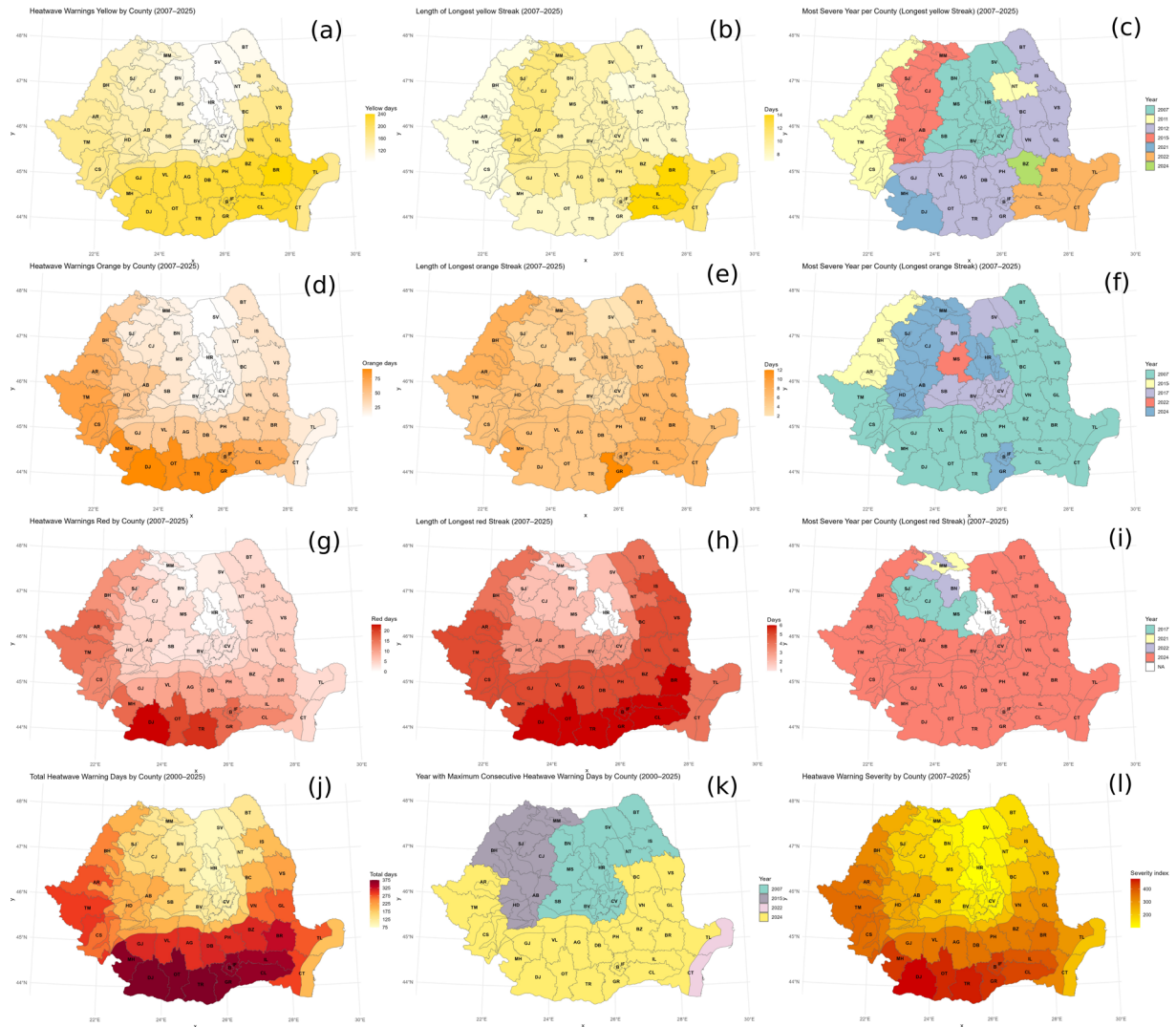


Figure S8. Spatial patterns of heatwave warnings in Romania (2007–2025): frequency, persistence, temporal occurrence, and cumulative severity

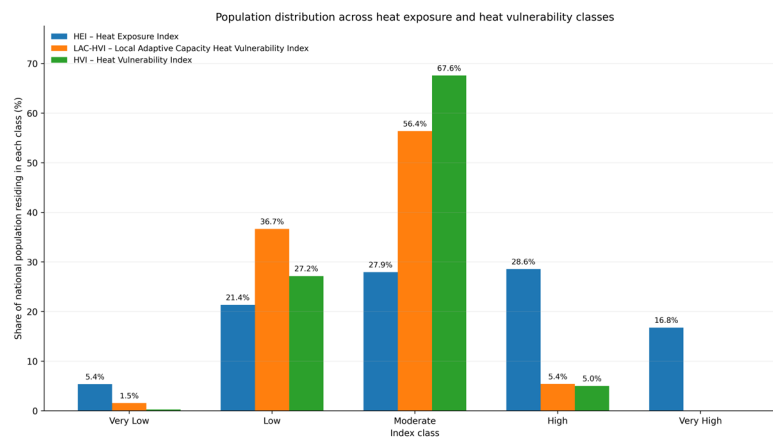


Figure S9. Comparison of population distribution across the Heat Exposure Index (HEI), Local Adaptive Capacity Heat Vulnerability Index (LAC-HVI), and Heat Vulnerability Index (HVI) classes. Bars represent the percentage of the national population residing in 1-km grid cells assigned to each index class. HEI incorporates population density as an exposure component, whereas LAC-HVI and HVI use the proportion of residents aged ≥ 65 years as the demographic sensitivity component. Total population is used only to quantify the number of residents within each class and is not an additional component of LAC-HVI or HVI. LAC-HVI represents a sensitivity-analysis formulation based on locally resolved adaptive-capacity indicators, whereas HVI represents the main multidimensional vulnerability index used in the study.

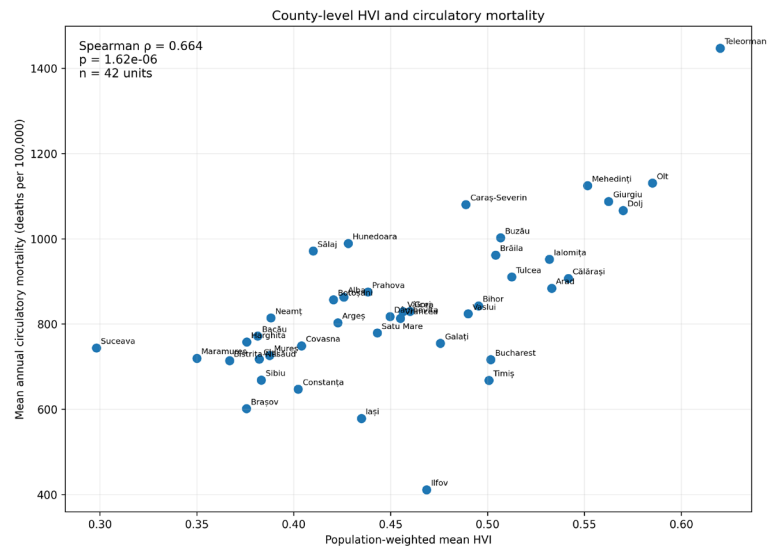


Figure S10. Relationship between population-weighted county-level Heat Vulnerability Index (HVI) and mean annual circulatory-system mortality in Romania (2000–2025)

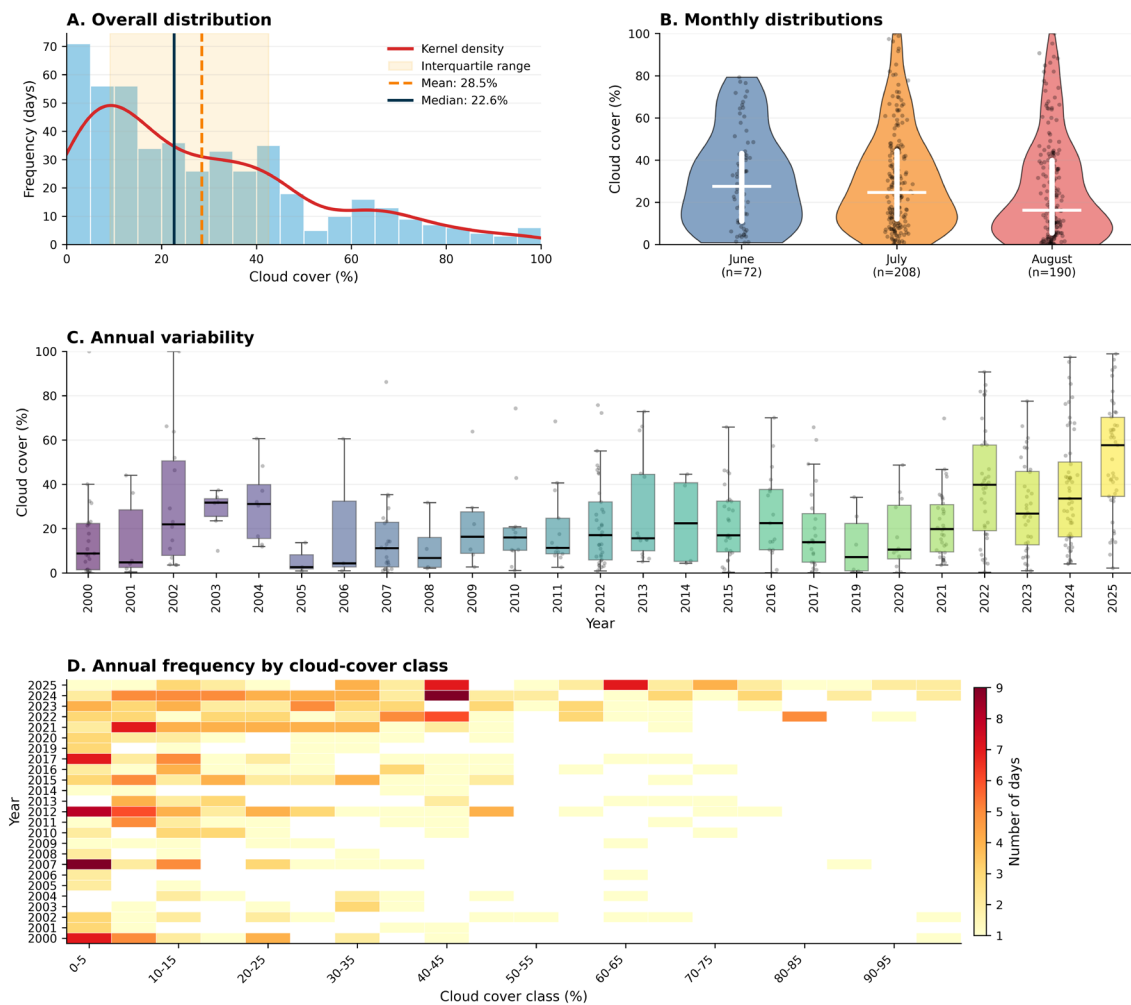


Figure S11. Cloud cover during heatwaves in Romania (2000–2025)