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Less heatwave-driving blocking under global warming

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Summer heatwaves often occur under persistent anticyclones, or blocking. Here we quantify the sole effect of blocking changes on the frequency of heatwaves under global warming in the CMIP6 climate models. We employ an optimized blocking index that best correlates with summer continental heatwaves. Our optimized index gives a Pearson correlation of 0.7 with continental heatwaves and a 1σ uncertainty of 0.20% in projecting 10-year-mean heatwave frequency. The index optimization is achieved by excluding blocking over the ocean, tuning thresholds, mandating perfect stationarity and detecting only anticyclonic anomalies. Counting only the effect of changes in blocking, we project a one fifth decrease in Northern Hemisphere heatwave frequency under SSP585 (a frequency decrease of 0.3% in comparison with the historical frequency of 1.7%). We also find that both the blocking–heatwave correlation and the index thresholds (amplitude and duration) giving the highest correlation, vary insignificantly over different continents and in the future. Therefore, the future increase of around 60% in heatwave frequency under SSP585 is not caused by blocking changes, but by factors, like those of thermodynamics, that boost blocking's capability in driving heatwaves.