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Higher temperatures enhance spatio-temporal rainfall concentration

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Warming climate has significantly influenced the environment on the earth, which attracts wide attention in society. Previous studies show that precipitation extremes increase with warmer temperature. This phenomenon has been observed in the regions with various climates, with the theoretical support of the Clausius-Clapeyron relation. However, the effect of temperature on the spatio-temporal characteristics of precipitation extremes are less studied. In this study, we propose a new index to represent the temporal and spatial concentration of rainfall events, and study how temperature affect the rainfall concentration. It is found that precipitation events tend to have higher temporal and spatial concentration at higher temperatures, and rain events with shorter duration is more likely to be concentrated than those with longer duration in both time and space. The results indicate that rain events would be concentrated over smaller regions and during shorter periods under warming climate in the future, which leads to flood and drought occurring simultaneously.