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Interannual Variability of Heat Wave in South Korea and theirs Connection with Large-Scale Atmospheric Circulation Pattern

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This study investigates the interannual variation of heat wave frequency (HWF) in South Korea during the past 42 years (1973-2014) and examines its connection with large-scale atmospheric circulation changes. Korean heat waves tend to develop most frequently in late summer during July and August. The leading Empirical Orthogonal Function (EOF) accounting for 50% of the total variance shows a mono-signed pattern over South Korea, suggesting that the dominant mechanisms responsible for the heat wave are linked in a spatial scale much larger than the nation. It also exhibits a regional variation with more occurrences in the southeastern inland area. The regression of the leading principal component (PC) time series of HWF with large-scale atmospheric circulation identifies a north-south dipole pattern between the South China Sea and Northeast Asia. When this large-scale circulation mode facilitates deep convection in South China Sea, it tends to weaken moisture transport from the South China Sea to Northeast Asia. Enhanced deep convection in the South China Sea triggers a source of Rossby wave train along southerly wind that generates positive geopotential height anomalies around Korea. The anomalous high pressure pattern is accompanied by large-scale subsidence in Korea, thereby providing a favorable condition for extreme hot and dry days in Korea. This study highlights that there is a decadal change of the relationship between Korean heat waves and large-scale atmospheric circulation patterns. The tropical forcing tends to be weakened in the recent decade, with more influences from the Arctic variability from the mid-1990s.