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Variability of Extreme temperature over East Asia and its relationships with teleconnection patterns

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This study investigates interdecadal and interannual variability in the occurrence of heat waves over East Asia in summer between 1973 and 2012. In particular, this study examines the dominant heat wave patterns, as obtained through empirical orthogonal function (EOF) analysis, and the associated variability in heat wave occurrence. In this study, heat wave days is defined as the number of days with temperatures in the highest 10th percentile of June to August (JJA) daily maximum temperatures. The regions where the 90th percentile of maximum temperature is below 29°C were excluded. We separated the heat wave days into low-frequency variation and high-frequency variation by using a band pass filter. The dominant variation modes of heat waves are related large-scale oceanic and atmospheric circulation. The low-frequency variation of heat waves in East Asia is highly correlated with the Atlantic Multidecadal Oscillation (AMO), which shows significant decadal changes before and after mid-1990s. In particular, the positive phase of the AMO leads to heat waves earlier in the summertime while also increasing their magnitude, frequency, and duration in East Asia. It is suggested that the likelihood of heat wave events will increase with further long-term climate warming, modified by low-frequency oceanic variations such as the AMO. In the high-frequency variation, two dominant modes are shown in East Asia. One is related with the Scandinavia pattern (SCAND) and the other with Circum Global Teleconnection pattern (CGT). This two teleconnection pattern seems to affect the location of convection and subsidence of the atmosphere and is a key process during heat wave events in the East Asian region.