Geophysical Research Abstracts
Vol. 21, EGU2019-3827-2, 2019
EGU General Assembly 2019

Dynamic mechanisms for heat waves over the Korean Peninsula using a unforced long-term simulation model

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The present study investigates the dynamic mechanisms by which natural variability impacts heat waves over the Korean Peninsula using the unforced long-term (500 years) Community Climate System Model Version 3 (CCSM3). From composite analysis, we find that extreme heat waves are concurrent with positive barotropic geopotential height (GHP) anomalies over the Korean Peninsula, thus promoting adiabatic warming due to subsidence and leading to an accumulation of heat. These height anomalies are likely related to central Pacific (CP) as well as North Atlantic (NA) sea surface temperature (SST) anomalies, explaining 47% of Korean heat wave events. The cold CP SST anomalies cause the anomalous cyclonic circulation and deep convection over the western North Pacific through wind-evaporation-SST feedback, which acts as a source of northward propagating Rossby waves toward the Korean Peninsula. In addition, the warm NA SST anomalies induce a barotropic Rossby wave train from the NA to East Asia across the European and Siberian landmasses and bring the positive barotropic GPH anomalies over the Korean Peninsula.