Geophysical Research Abstracts
Vol. 18, EGU2016-3179, 2016
EGU General Assembly 2016

Possible impacts of mega-El Niño/Southern Oscillation and Atlantic multidecadal oscillation on Eurasian heat wave frequency variability

Yefan Zhou (1) and Zhiwei Wu (2)

(1) Colloge of Atmospheric Science, Nanjing University of Information Science & Technology, China (314655911@qq.com), (2) Colloge of Atmospheric Science, Nanjing University of Information Science & Technology, China (zhiweiwu@nuist.edu.cn)

Identifying predictability sources of heat wave variations is a scientific challenge and of practical importance. This study investigates the summertime heat wave frequency (HWF) over Eurasia for 1950[U+F02D]2014. The Eurasian HWF is dominated by two distinct modes: the interdecadal (ID) mode featured by an increasing pattern overall, centered around eastern Europe-central Asia and Mongolia-southwestern China; the interannual (IA) mode resembling a tri-pole anomaly pattern with three centers over western-northern Europe, northeastern Asia and East Asia. The ID mode is found to be influenced by mega-El Niño/Southern Oscillation (mega-ENSO) and the Atlantic multidecadal oscillation (AMO), and the latter has far more effect, whereas the IA mode is connected with mega-ENSO.

Further analysis suggests that mega-ENSO variations can incite a Gill-type response spreading to Eurasia, while the AMO changes cause eastward-propagating Rossby wave trains toward Eurasia. These two teleconnection patterns together contribute to the large-scale circulation anomalies of the ID mode, and those related to the IA mode arise from the teleconnection pattern excited by mega-ENSO. A strong mega-ENSO triggers subsidence with high pressure anomalies, warms the surface and increases the HWF significantly over northeastern Asia particularly. Likewise, the warm AMO-induced circulation anomalies engender surface radiative heating and HWF growth in most of Eurasian continent except some localized Siberian and Asian regions. The situation is opposite for a weak mega-ENSO and AMO. Those models from phase 5 of the Coupled Model Intercomparison Project (CMIP5) which realistically capture the features of the ID mode can reproduce the AMO-like sea surface temperature anomalies (SSTAs), while signals resembling mega-ENSO are found in those with favorable capability of simulating the IA mode. On the contrary, these relevant SSTAs linked to the respective modes vanish in the models with little skills. Thus, mega-ENSO and the AMO might provide two critical predictability sources for heat waves over Eurasia.