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[Abstract Title]

Extreme High Temperature over Hotspots in the Northern Hemisphere: Internal Low-frequency Variation and Future Projection

[Abstract]

Extreme high temperature (EHT) has widespread impacts on human health, society, economies, and ecosystems. In the background of global warming, an in-depth understanding of the HW internal low-frequency (LF) variation and reliable HW projection are curial for disaster prevention and tackling climate change.
In the observation, five hotspots featuring large LF variations (longer than 10 years) in EHT during 1951-2017 were identified, including western North America–Mexico, eastern Siberia, Europe, central Asia, and the Mongolian Plateau. The component of decadal to multidecadal variations is the main contribution to the LF variations of temperature in the last century. Further analysis shows that the coherent variability of decadal to multidecadal temperature variations over western North America–Mexico, eastern Siberia, Europe, and the Mongolian Plateau are the footprints of a dominant natural internal signal: the Atlantic multidecadal oscillation.
Using a downscaled high-resolution NEX-GDDP dataset, EHT days over three mega-regions [the Eastern United States (EUS), Europe (EU) and Eastern Asia (EA)] during 1981-2005 were evaluated against observations. The observed EHT days over EU exhibit the most significant increases in frequency, intensity and extent, while no significant trend over EUS is found. The largest bias in NEX-GDDP is the remarkably overestimated increase in the trend over EUS, which could be

ascribed to modelling biases in aerosol effects and internal variation. In the RCP8.5 projection using optimal models with relatively high fidelity, the increase of EHDs is evidently enhanced during 2030–2054 over the three regions, particularly EUS. This study implies that both the natural internal variation and anthropogenic forcing play important roles in making hotspots more vulnerable to EHT but with distinct footprints. As a result, the future projection for regions with enormous impact of natural internal variation might exist large uncertainty.

[Keywords]

Extreme high temperature, Atlantic multidecadal oscillation, Future projection