
Heatwaves and the 1990s shift

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Abstract

The Northern Hemisphere summer warming during 1979-2020 is most severe in Europe, Central Siberia-Mongolia and the West Coast of North America. These hot spots are accompanied by a chain of high-pressure ridges from an anomalous, circumglobal, Rossby wave train in the upper troposphere. From reanalysis data and several Coupled Model Intercomparison Project Phase 6 (CMIP6) baseline experiments, we find that the trend pattern is associated with fluctuations of the Atlantic Multidecadal Variability (AMV) and the Interdecadal Pacific Oscillation (IPO), augmented by anthropogenic forcing. The phase shift of AMV in the 1990s is particularly noteworthy for accelerating the warming in the northern midlatitude summer. Furthermore, mechanistic modeling results indicate that synoptic eddy-mean flow interaction especially in the North Atlantic sector plays a key role in the formation of the anomalous circumglobal wavetrain, and both atmosphere-ocean and atmosphere-land interactions can contribute to this wavetrain and the location of the warming.

Keywords: decadal shift, IPO, AMV, midlatitude warming

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