

Atmospheric circulation patterns associated with temperature extremes over North America in observations and climate models

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Anthropogenic climate change will continue to change the mean temperature over the coming decades, however it is the events that occur in the tails of the temperature frequency distribution that have the greatest impact on society. To better understand atmospheric processes associated with temperature extremes, we have identified the most important atmospheric circulation patterns associated with extreme daily temperature events over North America in the 20th century. Using a gridded daily temperature data set and reanalysis data, we have developed composites of the anomalies of several relevant atmospheric variables concurrent with extreme temperature days for the continent. The composites were analyzed to show how the anomalous patterns associated with extreme events differ depending on season and geographic location and what patterns occur preferentially across the continent. Finally, this analysis was performed on a suite of general circulation model simulations of the climate of the 20th century to see how accurately the models simulate these large scale circulation patterns. Having a quantitative understanding of how climate models simulate circulation patterns associated with extreme temperature events will allow us to more confidently evaluate projected changes in extreme events in global warming simulations.