Change in persistent extratropical regimes under an Arctic amplified climate

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The Arctic surface air temperature has warmed more than twice as fast as the global average (e.g., Cohen et al. 2014), which is known as Arctic Amplification (AA). All the fifth Coupled Model Intercomparison Project (CMIP5) model projects that the warming become more and more conspicuous toward the end of this century, which is one of the most robust climate change signal projected by the models. Therefore, it is important to clarify the extent to which the AA influences the Northern Hemisphere mid-latitudes extreme events, especially recurrent and persistent circulation pattern which causes the heat wave and cold spell.
Here we use a 100-member ensemble of historical simulations and future projections with a hi-resolution atmospheric general circulation model to show that as a result of change in the climatological atmospheric flow induced by the AA, the probability of occurrence of a specific circulation anomaly pattern will increase in future. This circulation pattern is strongly tied to winter cold spell over the Northern Hemisphere mid-latitudes in present climate, but not necessarily in the Arctic amplified future climate. This is because a reduced climatological meridional temperature gradient in lower troposphere acts to weaken the variance of surface temperature.

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