

Arctic Climate Change and Extreme Midlatitude Events: Observational Analysis and Modeling Investigation

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Rapid climate change has occurred in the Arctic, which is representatively evidenced by a decade-long accelerating decline of sea ice and the extreme events of sea ice cover loss in summer 2007 and 2012. At the same time, drastic changes have also occurred in broader areas in the Northern Hemisphere or globally, including a spatial shift of the maximum surface air temperature warming trends from the Eurasian continent to the central Arctic Ocean, an enhancement of poleward oceanic and atmospheric heat transport from either the North Atlantic or North Pacific oceans into Arctic, and a widespread of extreme cold weather and snow storms from the US east coast to Europe and Asia. Many aspects of these changes are obviously beyond the scope of the conventional climate fluctuations, and also could not be solely accounted for by greenhouse-gas-emissions forcing. In this presentation, we synthesize recent progresses towards improving understanding of the rapid changes in Arctic and the Arctic-global climate interactions. The results include how changes in the atmospheric circulation orchestrate accelerated declining of sea ice, enhanced poleward transport atmospheric heat and moisture, intensified poleward intrusion of Atlantic and Pacific water into the Arctic Ocean, and increased discharge of Eurasian Arctic rivers. Influences of rapidly changed Arctic on recent Northern Hemisphere midlatitude storm tracks, surface climate, and extreme events will be also summarized. Finally uncertainties in Arctic climate change simulations and projections by using the CMIP3 and CMIP5 models will be discussed.