Evaluation of Atmospheric Response to Arctic Sea Ice Anomalies

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During the last decade, severe winters occurred frequently in mid-latitude Eurasia, despite increasing global- and annual-mean surface air temperature. Statistical analyses of observational data have suggested that some part of these cold winters were forced by Arctic sea-ice decline. However, numerical modelling studies have shown different conclusion depending on the used model and experimental settings, and whether or not the cause is due to sea ice reduction is controversial. Therefore, it is important to clarify the cause of the diversity of simulation results, especially the extent to which sea ice anomaly controls the atmospheric circulation.
In this research, we successfully detected the signature of Eurasian cold winters excited by sea-ice decline in the Barents-Kara Sea, by generating a four kind of long-term historical and large-member ensemble simulation based on atmospheric general circulation model (AGCM). The sea ice reduction tends to increase occurrence frequency of cold winter over the central Eurasia, but its effect may have been underestimated in the AGCM. We conclude that this is one of the big reasons that conclusion change depending on model experiments.

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