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Quantification of influence of Arctic sea-ice decline and natural variability to recent Eurasian cooling

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During the recent decades, severe winters occurred frequently in mid-latitude central Eurasia, as shown in long-term cooling trend of surface air temperature over there. Statistical relationship obtained from observational data have suggested that part of this cooling is forced by recent Arctic sea-ice decline. However, numerical modelling studies have shown disparate conclusion, and whether or not the cause is due to sea-ice reduction is controversial. In this research, we succeeded to detect the Eurasian cold winters excited by sea-ice decline in the Barents-Kara Sea, by analyzing observation and historical large ensemble simulations based on 7 different atmospheric general circulation model (AGCM) forced by observed sea surface temperature and sea ice. The sea-ice reduction tends to increase occurrence frequency of cold winter in the central Eurasia, but the sea-ice forced effect is underestimated in the AGCM compared with observation. We conclude that this model bias can be a major cause that makes diverse conclusions among modelling studies.