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Is recent Eurasian winter cooling caused by Arctic sea ice loss?

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The observed surface air temperature in the northern mid-latitudes shows a significant cooling trend in recent winters despite greenhouse gas concentrations continuing to rise. Such an unexpected cooling trend since late 1990's is especially strong over the Eurasia. Here, by performing statistical analyses and climate model experiment, we show that the recent Eurasian cooling trend is at least in part caused by Arctic sea ice loss over the Barents and Kara (BK) seas.

A significant time-lagged co-variability is observed between autumn sea ice concentrations over BK seas and winter surface air temperature over the Eurasia. More importantly, the timing of a rapid sea ice loss is consistent with the timing of Eurasian cooling. These results indicate that both interannual variability and long-term trend of Eurasian winter surface air temperature are likely influenced by regional sea ice changes over BK seas. This conjecture is confirmed by climate model experiment. A coupled model, GFDL CM2.1, is integrated with a pre-industrial condition except for the Arctic regions where observed sea surface temperature is relaxed. Ensemble simulations successfully reproduce the recent cooling trend over the Eurasia although the timing is bit delayed (i.e. early 2000's instead of late 1990's). However, it is found that this cooling trend is unlikely explained by linear dynamics, and is not associated with changes in atmospheric blocks.