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### ROBUST ARCTIC SEA-ICE INFLUENCE ON THE FREQUENT EURASIAN COLD WINTERS IN PAST DECADES

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During the last decade, severe winters occurred frequently in mid-latitude Eurasia, despite continuous increase in greenhouse gas concentrations. Statistical analysis of observation have suggested that these cold Eurasian winters were excited by Arctic sea-ice decline. However, it was not yet clear whether the cooling anomalies are a dynamical response to the sea-ice loss or natural fluctuation of the atmosphere, because a robust response was yet to be obtained in the numerical model simulations due to energetic internal fluctuations in 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 100-member ensemble of state-of-the-art atmospheric general circulation model simulations driven with realistic sea-ice concentration anomalies<sup>1</sup>. We conclude that the observed cold Eurasian winters in the last decade are attributable to a combination of the natural fluctuation and the response to sea-ice loss, and the latter having larger contributions.

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<sup>1</sup> Mori, M., M. Watanabe, H. Shiogama, J. Inoue, and M. Kimoto, (2014): Robust Arctic sea-ice influence on the frequent Eurasian cold winters in the past decades, *Nature Geoscience*, doi:10.1038/ngeo2277.