

Influence of the Gulf Stream on the Barents Sea ice retreat and Eurasian coldness during early winter

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Abnormal sea-ice retreat over the Barents Sea during early winter has been considered a leading driver of recent midlatitude severe winters over Eurasia. However, causal relationships between such retreat and the atmospheric circulation anomalies remains uncertain. Using a reanalysis dataset, we found that poleward shift of a sea surface temperature front over the Gulf Stream likely induces warm southerly advection and consequent sea-ice decline over the Barents Sea sector, and a cold anomaly over Eurasia via planetary waves triggered over the Gulf Stream region (Fig a). The above mechanism is supported by the steady atmospheric response to the diabatic heating anomalies over the Gulf Stream region obtained with a linear baroclinic model (Fig b). The remote atmospheric response from the Gulf Stream would be amplified over the Barents Sea region via interacting with sea-ice anomaly, promoting the warm Arctic and cold Eurasian pattern.

