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ROLE OF SEA ICE REDUCTION IN EURASIAN WINTERTIME COOLING

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Despite a general warming of the Northern Hemisphere in recent decades, a pattern of extremely cold winters has emerged as a robust feature in observations over the last few years over northern continental Europe, Asia and North America. In this study, a region of cooling over mid-latitude Eurasia is identified in the wintertime surface air temperatures of the ERA-Interim and NCEP/NCAR reanalyses. This Eurasian wintertime cooling is related to the decrease of sea ice concentrations in the Arctic. Singular value decomposition (SVD) is used to identify the temporal and spatial pattern of co-variability between the Arctic sea ice concentrations and mid-latitude Eurasian wintertime temperatures (Figure 1). For ERA-Interim, the primary mode explains approximately 59% of the co-variability between these two fields with a strong coupling correlation of R=0.68 ($p \leq 0.05$). The study is extended by examining 20 CMIP5 models for the same pattern of co-variability. While wintertime cooling over Eurasia is found in only a few of the models, the majority do show the same pattern of co-variability between decreasing Arctic sea ice and wintertime Eurasian surface temperatures. This suggests that the Eurasian cooling may be a secondary response to the warming climate of the Arctic.

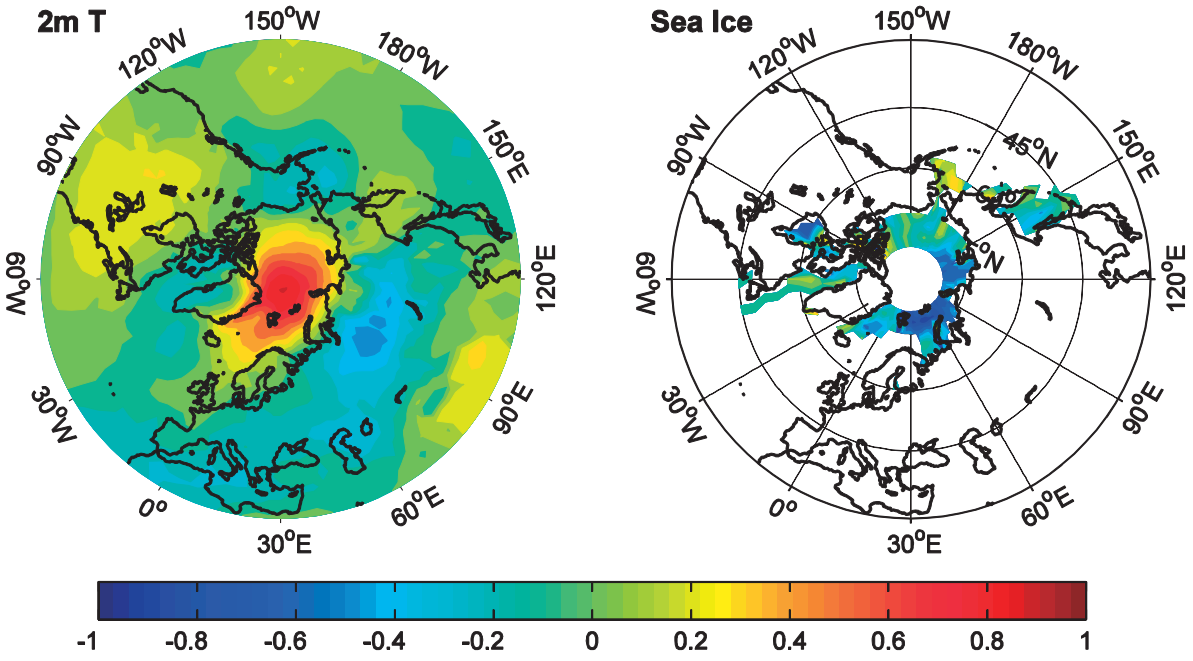

Figure 1: Spatial patterns of the first SVD mode for co-variability between 2-metre temperature (left) and sea ice concentration (right) based on 1989-2009 of the ERA-Interim reanalysis.