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Arctic sea ice decline and continental cold anomalies: Upstream and downstream effects of Greenland blocking

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The regression shows that the surface air temperature (SAT) in response to the Arctic sea ice decline has three cold anomaly centers: central-eastern Asia, North Europe and eastern North America (mainly eastern United States). The physical cause of the Greenland blocking (GB) affecting cold SAT anomalies in the Northern Hemisphere (NH) continents is examined. It is found that westward-moving Greenland blocking (WGB) events increase significantly and its upstream region that is attributed to intensified Arctic warming over Greenland. In addition, the modest decline of the BDL sea ice is found to favor quasi-stationary Greenland blocking (QGB) events.
The composite analysis reveals that the WGB has a strong upstream effect on NH cold anomalies, whereas the QGB acts as a major downstream effect. For the WGB, an intense cold anomaly seen over the eastern North America, while a weak cold anomaly over the North Europe. It is concluded that the cold air outbreaks over the eastern North America should be more frequent under a strong declining condition of the BDL sea ice.