



## **Large-Scale Controls of North American Cold Spells and European Windstorms**

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During recent winters, both extreme cold events in eastern North America and stormy, rainy weather over western Europe have garnered widespread scientific and media coverage. Their notable co-occurrence raises the question of whether there may be a systematic, physically based link between the two. Here, we explore the statistics and dynamics of these coordinated extremes in reanalysis products.

The cold spells are driven by wavenumber 5 wave packets which induce a northerly advection of cold air from the Arctic region into North America. We link these wavepackets to the second Circumglobal Teleconnection Pattern introduced by Branstator and defined as the second EOF of the monthly-mean upper-tropospheric meridional wind. The waves are seen to propagate all the way from Eurasia, across North America and into the Atlantic.

Over the North Atlantic, the large-scale circulation associated with the cold spells corresponds to a very zonal and intense jet stream, shifted persistently south of its climatological location. These features of the Atlantic jet are conducive to destructive windstorms and intense precipitation over a large part of southern and continental Europe and the British Isles.

We note that the atmospheric patterns we discuss over both North America and the North Atlantic are distinct from well-known modes of climate variability such as the PNA and the NAO.