EMS Annual Meeting Abstracts
Vol. 14, EMS2017-807, 2017

Extreme cold over North America and storminess in Europe orchestrated by stationary Rossby wave packets from the Pacific

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Recent winters have seen a remarkable coincidence between extreme cold events in eastern North America and enhanced storminess in western Europe. Here, we explore the statistics and dynamics of such coordinated extremes using reanalysis products. We find that these events are orchestrated by a wave packets propagating all the way from the western equatorial Pacific, over North America and into the Atlantic. Over North America, the waves induce northerly advection and surface cold anomalies spreading south-eastwards from Canada to the US eastern seaboard; in the Atlantic, they induce a very intense and zonally-oriented North Atlantic jet shifted persistently south of its climatological location, which favours the occurrence of wind and precipitation extremes over Europe. The wave packets in question consist of quasi-stationary waves with a dominant wavenumber 5. We propose that these wave packets are associated with one of the two Circumglobal Teleconnection Patterns (CTPs) introduced by Branstator and defined as the two leading EOFs of monthly-mean upper-tropospheric meridional wind. While the first CTP is related to the Pacific-North American (PNA) pattern, North American cold events are associated with the second pattern which is by definition in quadrature with (and thus entirely distinct from) the PNA. The anomalies over the Atlantic are also quite distinct from the better-known North Atlantic Oscillation (NAO).