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The winter North Atlantic eddy-driven jet: two-dimensional structure and its link to European weather regimes

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The large-scale midlatitude circulation exhibits large variability over a range of time scales, and influences regional weather and climate. The goal of this study is to link the climate dynamics perspective of this variability (jet stream fluctuations) to the synoptic dynamics perspective (weather regimes, i.e. recurrent and quasi-stationary states of the large-scale atmospheric circulation persisting over one or several weeks). In the North Atlantic, the jet stream is found at three preferred latitudes, but it is not fully understood why these latitudes are preferred and which mechanisms are responsible for latitudinal shifts of the jet. In terms of weather regimes (WRs), four regimes are robustly identified for the winter season in the Atlantic-European region, independent of the specific diagnostic approach.

To link jet variability to weather regimes, we first perform a cluster analysis of the zonal wind over the North Atlantic basin. The approach reveals that, besides the three preferred jet latitude positions, a fourth long-lasting jet configuration exists. This fourth cluster corresponds to a mixed jet, with either two separated branches or a single jet with a pronounced southwest-northeast tilt, and seems to be associated with the Scandinavian blocking WR.