

The dynamics of cyclone clustering in re-analysis and a high-resolution climate model

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Extratropical cyclones have a tendency to occur in groups (clusters) in the exit of the North Atlantic storm track during wintertime, potentially leading to widespread socioeconomic impacts.

The Winter of 2013/14 was the stormiest on record for the UK and was characterised by the recurrent clustering of intense extratropical cyclones. This clustering was associated with a strong, straight and persistent North Atlantic 250 hPa jet with Rossby wave-breaking (RWB) on both flanks, pinning the jet in place. Here, we provide for the first time an analysis of all clustered events in 36 years of the ERA-Interim Re-analysis at three latitudes (45°N, 55°N, 65°N) encompassing various regions of Western Europe. The relationship between the occurrence of RWB and cyclone clustering is studied in detail. Clustering at 55°N is associated with an extended and anomalously strong jet flanked on both sides by RWB. However, clustering at 65(45)°N is associated with RWB to the south (north) of the jet, deflecting the jet northwards (southwards). A positive correlation was found between the intensity of the clustering and RWB occurrence to the north and south of the jet. However, there is considerable spread in these relationships.

Finally, analysis has shown that the relationships identified in the re-analysis are also present in a high-resolution coupled global climate model (HiGEM). In particular, clustering is associated with the same dynamical conditions at each of our three latitudes in spite of the identified biases in frequency and intensity of RWB.