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Clustering of tropical cyclones in the North Atlantic

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We investigate the spatial dependence of and the large-scale atmospheric and climatic effects on the clustering of tropical cyclones in the North Atlantic Ocean. Tropical cyclone tracks from the HURDAT database are examined. We study the transit of tropical cyclones near points belonging to a grid covering the North Atlantic Ocean. Clustering is characterized by the dispersion (ratio of the variance and the mean) of the yearly counts of cyclone transits at distance less than a radius R from the gridpoints.

Coherent patches of overdispersion are found for large radii (R>=300km) in the main development region, in the central North Atlantic, off the Mexican coast in the Gulf of Mexico and in the Caribbean sea. Transits of tropical cyclones with intense windspeeds (>60kt) are overdispersed in smaller regions. Patches of overdispersion occur in the central North Atlantic and in a region surrounding the souther coast of Florida, the western coast of Cuba and the coast of Belize.

The influence of large-scale atmospheric and climatic processes is analysed by Poisson regression with a time-varying rate that depends on indices for the Atlantic Multidecadal Oscillation (AMO), the North Atlantic Oscillation (NAO) and the Southern Oscillation (SO). A clear-cut signal is found at the largest spatial scales (R>=300km). The AMO has positive effects on the local transit rate in a very large region of the North Atlantic, around the main development region and Caribbean Sea. Positive effects are found for the NAO around Cuba and the Caribbean. Negative (though small) effects are found for the SOI in the Caribbean and the Gulf of Mexico.