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Modulation of Tropical Cyclone Activity and Rainfall by the North Atlantic Oscillation

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This study focuses on the influence of the North Atlantic Oscillation (NAO) on interannual tropical cyclone (TCs) activity and rainfall using observational and reanalysis products. Using Poisson regression models, we show that the low-frequency NAO variability is associated with a distinct pattern of TC activity across the North Atlantic basin. Across the western Atlantic, the Caribbean Basin and the Gulf of Mexico, TC activity increases as the NAO decreases: an interquartile range decrease in the NAO corresponds to a 30-40 % increase in TC track density. While the NAO is known to affect the weather regimes of the mid-latitudes, we show that its low-frequency component influences the large-scale environment across Main Development Region. The negative NAO phase is associated with significantly higher Sea-Surface Temperature (SST) and lower tropospheric wind shear. Finally, we investigate whether the NAO influence on TC activity can be detected in the basin-scale variations of TC rainfall. By building monthly rainfall composites from satellite and reanalysis products, we show that TC rainfall is indeed strongly enhanced in the Caribbean and in the Gulf of Mexico during the negative phase of the NAO. Such modulation is particularly evident during neutral or La Niña conditions.