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Interannual Variability of Wind Power Input to Near-inertial Motions in the North Atlantic

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Near-inertial oscillations are ubiquitous in the ocean and are believed to play an important role in the global climate system. Studies on wind power input to near-inertial motions (WPI) have so far focused primarily on estimating the time-mean WPI, with little attention being paid to its temporal variability. In this study a combination of atmospheric reanalysis products, a high-resolution ocean model, and linear regression models are used to investigate for the first time the relationship between interannual variability of WPI in the North Atlantic and the North Atlantic Oscillation (NAO), motivated by the idea that the NAO serves as a good indicator for storminess over the
North Atlantic and that storms account for the majority of WPI. It is found that WPI at low and high latitudes of the North Atlantic is significantly correlated to the NAO, owing to its influence on the configuration of the storm track. Positive (negative) NAO conditions are associated with increased WPI in the subpolar (subtropical) ocean. Basin-wide WPI is found to be significantly enhanced under negative NAO conditions, but is not significantly different from the climatological average under positive NAO conditions. This is indicates a weak inverse relationship between basin-wide WPI and the NAO, contradicting intuitive expectations. The asymmetric impact of the NAO on basin-wide WPI results from greater sensitivity of WPI to near-inertial wind forcing at lower latitudes due to the variation of the Coriolis parameter with latitude.