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Evaluation of hub-height wind forecasts over the New York Bight

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As offshore wind energy development accelerates in the U.S., it is important to assess the accuracy of hub-height wind forecasts from numerical weather prediction models over the ocean. Leveraging approximately two years of Doppler lidar observations from buoys in the New York Bight, we provide an evaluation of 80-m wind speed forecasts from two weather models: the High-Resolution Rapid Refresh (HRRR) model and the Global Forecast System (GFS). These two models have different horizontal (3 km vs 13 km) grid spacing, vertical layering, initialization methods, and parameterizations of boundary layer mixing and surface-atmosphere interactions. Even with these differences, the models demonstrate similar and highly skillful short-term forecasts at three measurement sites (Day 1: root mean square error, RMSE, $\leq$ 2.4 m/s and $r \geq 0.83$; Day 2: RMSE$\leq$3 m/s and $r \geq 0.77$). Day-ahead forecasts also exhibit skill (Critical Success Index > ~0.5) in predicting quiescent winds and winds associated with maximum turbine power. By Day 10, GFS forecasts on average have almost no skill. Short-term forecast skill by the HRRR and GFS does not strongly depend on season or time of day, yet we find some dependence of the models' performance on near-surface stability. Additionally, 5-14 day forecasts by the GFS exhibit lower RMSE during summer relative to other seasons. The high skill of the HRRR and GFS short-term forecasts establishes confidence in their utility for offshore wind energy maintenance and operation.