

Observations and Large-Eddy Simulations of Wind Gusts in Hurricanes

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Measurements of wind speed in strong hurricanes are rare. Hurricanes are infrequent, they typically occur far from land, and (of course) they are hazardous, making high-quality data collection quite difficult. Some observations have shown that near-surface wind speeds can exceed 100 m/s, but these measurements are often dismissed as "suspect." More certain measurements of maximum wind speed in hurricanes would be useful for a variety of applications, such as the design of wind turbines that are planned for the east coast of the United States. To help address this gap in knowledge, we have been using large-eddy simulations of idealized hurricanes with grid spacing as small as 31 m. Our simulations feature near-surface wind gusts exceeding 110 m/s, and values of gust factor (the ratio of peak wind to average wind) exceeding 1.7. We have identified a coherent structure that is associated with these gusts, which exists in the strongly sheared region between the eye and eyewall of the simulated hurricanes. These simulations are also being used to assess the ability of observing platforms to measure peak wind gusts, including new technologies such as unmanned aerial vehicles.

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