Abstract Submitted
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Prediction and control of coupled-mode flutter in future wind turbine blades[1] YAHYA MODARRES-SADEGHI, TODD CURRIER, University of Massachusetts, Amherst, LUCA CARACOGLIA, Northeastern University, MATTHEW LACKNER, CHRISTOPHER HOLLOT, University of Massachusetts, Amherst — Coupled-mode flutter can be observed in future offshore wind turbine blades. We have shown this fact by considering various candidate blade designs, in all of which the blade's first torsional mode couples with one of its flapwise modes, resulting in coupled-mode flutter. We have shown how the ratio of these two natural frequencies can result in blades with a critical flutter speed even lower than their rated speed, especially for blades with low torsional natural frequencies. We have also shown how the stochastic nature of the system parameters (as an example, due to uncertainties in the manufacturing process) can significantly influence the onset of instability. We have proposed techniques to predict the onset of these instabilities and the resulting limit-cycle response, and strategies to control them, by either postponing the onset of instability, or lowering the magnitude of the limit-cycle response.

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