Abstract Submitted
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Coupled-mode flutter in wind turbine blades – numerical prediction and experimental evidence.[1] YAHYA MODARRES-SADEGHI, TODD CURRIER, PIETER BOERSMA, BRIDGET BENNER, University of Massachusetts Amherst, XAVIER AMANDOLESE, Ecole Polytechnique, France — We present a model to predict the onset of couple-coupled flutter in wind turbine blades as well as the post-instability behavior of the blade. While linear models to predict the onset of wind turbine blade instabilities have been around for a while, nonlinear models are lacking. Besides, experimental results to show these instabilities and to validate the models for wind turbine blades do not exist. We discuss a nonlinear model to predict these instabilities and present experimental results at two different scales to validate the model: one set with blades of around 40 cm in length and the other set with blades of around 200 cm in length. In both series of experiments dynamic instabilities are observed. The larger-scale tests enable us to observe the coupling of two blade modes in a coupled-mode response, as well as oscillations purely in the torsional direction at higher wind speeds. The coupled-mode flutter is also predicted in the nonlinear numerical model.

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