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Wavelet diagnostics of the flow control of unsteady separation on a 2D Wind Turbine Airfoil[1] ZHE BAI, JACQUES LEWALLE, GUANNAN WANG, MARK GLAUSER, Syracuse University — We investigated the aerodynamic characteristics of a 2D wind turbine airfoil. Unsteadiness was associated with the wake of a cylinder upstream of the airfoil. The experiments were conducted in both the baseline case, and with active closed-loop control on the suction surface of the airfoil. The data consisted of surface pressure time series. Continuous wavelet analysis gave the phase, band-pass filtered signals and envelope of harmonics of the fundamental shedding frequency. Coherence of pairs of signals was also used to map the flow characteristics. For the baseline and controlled case, we will report on the relation between phase of the leading edge fluctuations, unsteady flow separation and lift and drag coefficients. Our goal is to develop a more effective controller.

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