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3D Numerical Analysis of Flow Control on Wind Turbine Blades ONKAR SAHNI, Rensselaer Polytechnic Institute, ERTAN KARAISMAIL, CCNI/SCOREC, Rensselaer Polytechnic Institute — Wind turbine blades are exposed to unsteady and spatially-varying loadings in a real field. These loadings result in fluctuating structural forces which in turn lead to failure of blades as well as gearbox. In this study, we perform numerical analysis of flow over a wind turbine blade placed in a wind tunnel; where dynamic motions are imposed to the blade in order to emulate scenarios observed in a real field. Furthermore, we also study the effect of active flow control (via synthetic-jets) on unsteady aerodynamic characteristics of the blade under dynamic motions; the idea is to be able to control aerodynamic loads and mitigate failures. Numerical analysis is based on massively parallel simulations using hybrid turbulence models. Comparisons with experimental data will also be included.

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