Improved modelling of fatigue loads in wind farms under non-neutral ABL stability conditions

The purpose of this study is to improve the predictive capability of the Dynamic Wake Meandering (DWM) model generalized to non-neutral atmospheric boundary layer (ABL) conditions in general and under stable ABL stratification in particular. The emphasis is on rotating wind turbine components, and the model improvement in focus is intimately linked to a newly developed refinement of the classic Monin-Obukhov theory, which, for stable ABL stratification, primarily results in less pronounced mean wind shear outside the surface layer, where most modern wind turbines are operating. The model improvements are validated against a huge set of full-scale data, which allows for a one-to-one comparison of wind turbine load simulations and measurements conditioned on ABL stability conditions.

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