Abstract Submitted
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Assessing the Impacts of Low Level Jets' Negative Wind Shear over Wind Turbines.[1] WALTER GUTIERREZ, Department of Mechanical Engineering, Texas Tech University, Lubbock, Texas 79409, USA, ARQUIMEDES RUIZ-COLUMBIE, National Wind Institute, Texas Tech University, Lubbock, Texas 79409, USA, MURAT TUTKUN, Institute for Energy Technology (IFE), Kjeller, Norway, LUCIANO CASTILLO, Department of Mechanical Engineering, Texas Tech University, Lubbock, Texas 79409, USA — Nocturnal Low Level Jets (LLJs) are defined as relative maxima in the vertical profile of the horizontal wind speed at the top of the stable boundary layer. Such peaks constitute major power resources, since they are observed at altitudes within the heights of commercial-size wind turbines. However, a wind speed maximum implies a transition from a positive wind shear below the maximum height to a negative one above. The effect that such transition inflicts on wind turbines has not been thoroughly studied. Here we focused on the impacts that the LLJ negative wind shears have over commercial size wind turbines. Using actual atmospheric LLJ data of high frequency as input for the NREL aeroelastic simulator FAST, different scenarios were created varying the LLJ maximum height with respect to the wind turbine hub height. We found only slight changes in the deflection and load averages for those scenarios, whereas the corresponding variances appear to decrease when a larger portion of the wind turbine sweeping area is affected by the negative shear. The exception was observed in the junction between the tower top and the nacelle, where a deflection maximum was detected that might reveal a critical structural point.

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