Abstract Submitted
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Towards grid-converged wall-modeled LES of atmospheric boundary layer flows[1] SHASHANK YELLAPANTULA, GANESH VIJAYAKUMAR, MARC HENRY DE FRAHAN, MATTHEW CHURCHFIELD, MICHAEL SPRAGUE, Natl Renewable Energy Lab — Accurate characterization of incoming atmospheric boundary layer (ABL) turbulence is a critical factor in improving accuracy and predictive nature of simulation of wind farm flows. Modern commercial wind turbines operate in the log layer of the ABL that are typically simulated using wall-modeled large-eddy simulation (WMLES). One of the long-standing issues associated with wall modeling for LES and hybrid RANS-LES for atmospheric boundary layers is the over-prediction of the mean-velocity gradient, commonly referred to as log-layer mismatch. Kawai and Larsson in 2012, identified under-resolution of the near-wall region and the incorrect information received by the wall model as potential causes for the log-layer mismatch in WMLES of smooth-wall boundary-layer flows. To solve the log layer mismatch issue, they proposed linking the wall model to the LES solution at a physical of height of y_m, instead of the first grid point. In this study, we extend their wall modeling approach to LES of the rough-wall ABL to investigate issues of log-layer mismatch and grid convergence.

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Ganesh Vijayakumar
Natl Renewable Energy Lab

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