Abstract Submitted
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Hybrid RANS-LES using high order numerical methods[1] MARC HENRY DE FRAHAN, SHASHANK YELLAPANTULA, GANESH VIJAYAKUMAR, Natl Renewable Energy Lab, ROBERT KNAUS, Sandia National Laboratory, MICHAEL SPRAGUE, Natl Renewable Energy Lab — Understanding the impact of wind turbine wake dynamics on downstream turbines is particularly important for the design of efficient wind farms. Due to their tractable computational cost, hybrid RANS/LES models are an attractive framework for simulating separation flows such as the wake dynamics behind a wind turbine. High-order numerical methods can be computationally efficient and provide increased accuracy in simulating complex flows. In the context of LES, high-order numerical methods have shown some success in predictions of turbulent flows. However, the specifics of hybrid RANS-LES models, including the transition region between both modeling frameworks, pose unique challenges for high-order numerical methods. In this work, we study the effect of increasing the order of accuracy of the numerical scheme in simulations of canonical turbulent flows using RANS, LES, and hybrid RANS-LES models. We describe the interactions between filtering, model transition, and order of accuracy and their effect on turbulence quantities such as kinetic energy spectra, boundary layer evolution, and dissipation rate.

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