Abstract Submitted
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**Evaluation of drag forcing models for vertical axis wind turbine farms**[1] BRIAN PIERCE, PARVIZ MOIN, Stanford University, JOHN DABIRI, California Institute of Technology — Vertical axis wind turbines (VAWTs) have the potential to produce more power per unit area than horizontal axis wind turbines (HAWTs) in a wind farm setting (Kinzel et al. J. Turb. [2012]), but further understanding of the flow physics is required to design such farms. In this study we will model a large wind farm of VAWTs as an array of 100 circular cylinders which will allow a comparison with a laboratory experiment (Craig et al. DFD 2013). The geometric complexity and high Reynolds numbers necessitate phenomenological modeling of the interaction of the turbine with the fluid, which is done through point drag models similar to those found in canopy flow simulations (e.g. Dupont et al. J. Fluid Mech. [2010]). We will present a detailed study of the point drag model performance for flow over one cylinder, providing an evaluation of the model's fidelity as it relates to quantities of interest for the VAWT farm. Next we will present results for flow through the cylinder array, emphasizing validation of the model and insight into VAWT wind farm dynamics. We will also discuss the effect of wall modeling on the calculations, as the Reynolds number of the problem requires the application of wall modeling of the turbulent boundary layer above the ground to keep the cost manageable.

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