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On the viability of wind farms with 2- and 3-bladed wind turbines: a numerical and experimental study. IMRAN HAYAT, University of Illinois at Urbana-Champaign, TANMOY CHATTERJEE, JULIA PEET, Arizona State University, LEONARDO P. CHAMORRO, University of Illinois at Urbana-Champaign — With offshore wind farms gaining substantial momentum in recent years, 2-bladed turbines (2BT) are increasingly becoming a viable alternative to 3-bladed counterparts (3BT). Numerical simulations and laboratory experiments with wind farms containing 2BT and 3BT in alternating rows were performed to explore potential benefits associated with the relatively higher momentum available in the wake of 2BT. The flow within and above the wind farm and power measurements were inspected for various wind farm layouts. Large-Eddy simulations complemented with wind-tunnel measurements at various locations revealed distinctive effects of the 2BT on the power output of the wind farms as well as the distribution and structure of the surrounding flow. During the talk, we will discuss the potential of using a combination of 2BT and 3BT for practical applications.

Imran Hayat
University of Illinois at Urbana-Champaign

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