Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

The Fluid Physics Measurement Challenges of Wind Plants. LEONARDO CHAMORRO, University of Illinois at Urbana-Champaign — The monotonic growth of wind energy brings numerous and new challenges in several scientific and engineering disciplines. Trends point towards designing larger wind farms with larger units in complex terrains, harsh environments, and offshore with fixed and floating units. Understanding the atmospheric boundary layer flow, unsteady flow-structure interaction, wake dynamics within wind farms, as well as loads and power fluctuations, are crucial to making this renewable energy resource sustainable and competitive (see Veers et al., DOI: 10.1126/science.aau2027). Several factors challenge the required characterization of related phenomena at laboratory and field scales. Scaling effects and representing multiscale processes are some barriers in laboratory experiments, whereas cost, fidelity, and flexibility are usually limiting factors in field measurements. Here, I will briefly illustrate current approaches used to capture the underlying flow physics in wind plants and will discuss measurement limitations and challenges at the laboratory and field settings.

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Date submitted: 10 Aug 2020 Electronic form version 1.4