Abstract Submitted
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Kinetic Energy Transport in a Vertical-Axis Wind Turbine Array[1] MATTHIAS KINZEL, DANIEL ARAYA, JOHN DABIRI, Caltech — We present experimental results from a full scale array of vertical-axis wind turbines (VAWTs) under natural wind conditions. The wind velocities throughout the turbine array are measured using a portable meteorological tower with seven, vertically-staggered, three-component ultrasonic anemometers. These measurements yield detailed insight into the turbine wakes and the recovery of the flow velocity behind the turbines. Quadrant hole analysis is employed to gain a better understanding of the energy transport at the top and the bottom of the VAWT array. The results are compared to the flow in horizontal-axis wind farms as well as urban and plant canopies. Emphasis is given to the flow physics in the adjustment region of the canopy, i.e. the region where the flow transitions from an atmospheric boundary layer to a canopy flow.

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