

Abstract Submitted
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Quantitative Full-Scale Wind Turbine Flow Measurements¹

MATTHIAS KINZEL, QUINN MULLIGAN, JOHN DABIRI, Caltech — To analyze the interaction between vertical axis wind turbines (VAWT) in detail it is important to gain a deeper understanding of their flow field. Quantitative in situ measurements pose a great challenge because of the large spatial dimensions, high flow velocities and remote locations of the VAWT. The aim of this work is to perform Particle Image Velocitometry (PIV) in a horizontal cross section of a VAWT. The major difficulty is the choice of adequate seeding particles and illumination method for the large field of view, which is necessary. The flow velocities on the other hand require a high speed camera and the whole setup has to be powered self-sufficiently. However, PIV yields a two dimensional two component velocity field together with the out of plane component of vorticity and is therefore a considerable advantage over the single point measurements which are available today. The presentation will deal with different methods for seeding the flow. The properties of these flow tracers will be discussed and their ability to follow the flow reliably evaluated. Preliminary PIV results of the wind velocities at the test site will be shown.

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