

Abstract Submitted
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Investigation on wind turbine wakes: wind tunnel tests and field experiments with LIDARs GIACOMO VALERIO IUNGO, EPFL, TING WU, JULIETTE CÖEFFÉ, FERNANDO PORTÉ-AGEL, WIRE TEAM — An investigation on the interaction between atmospheric boundary layer flow and wind turbines is carried out with wind tunnel and LIDAR measurements. The former were carried out using hot-wire anemometry and multi-hole pressure probes in the wake of a three-bladed miniature wind turbine. The wind turbine wake is characterized by a strong velocity defect in the proximity of the rotor, and its recovery is found to depend on the characteristics of the incoming atmospheric boundary layer (mean velocity and turbulence intensity profiles). Field experiments were performed using three wind LIDARs. Bi-dimensional scans are performed in order to analyse the wake wind field with different atmospheric boundary layer conditions. Furthermore, simultaneous measurements with two or three LIDARs allow the reconstruction of multi-component velocity fields. Both LIDAR and wind tunnel measurements highlight an increased turbulence level at the wake boundary for heights comparable to the top-tip of the blades; this flow feature can produce dangerous fatigue loads on following wind turbines.

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