



Doppler Lidar measurements of a wind turbine wake dynamics

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Wind flow features, both upwind and downwind of a research wind turbine were simultaneously measured by the High-Resolution Doppler Lidar (HRDL) during the Turbine Wake and Inflow Characterization Study (TWICS) in the spring of 2011. The ability of HRDL to sweep the atmosphere, both along constant azimuth and along constant elevation angles was used to develop a scanning strategy and to provide a variety of high resolution information on wake parameters. The velocity deficit, wake downwind extent, and wake meandering were estimated for different wind speed, wind direction, and boundary layer stability conditions. Results obtained from both vertical-slice scans, performed straddling along the lidar-turbine centerline, and conical sector scans, performed in narrow, nearly horizontal sectors that include the wind turbine inflow, and its wake at four levels, showed averaged velocity deficits of 6-8 m s⁻¹ extending up to 10 rotor diameters downstream of the turbine.