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Rotor wake turbulence

As wind energy is becoming a more mature technology more and more wind farms will be put up around the world. A single wind turbine can in itself be an impressive piece of engineering. But when you combine a large number of wind turbines in a wind farm it is taken to a new level and so is the complexity of the flow conditions experienced by the individual turbine. Depending on the wind direction, weather conditions and operating points of the other turbines in the park, the wind conditions seen by two turbines in the same park can therefore be very different. While one turbine has optimum conditions, another turbine can at the same time experience a high load conditions and have low production. A lot of work is being put into developing numerical models, capable of predicting the flow conditions inside wind parks. An important input in the process of validating such models is experimental data obtained under controlled conditions in a wind tunnel.

My project focuses on obtaining such experimental data. This is mainly achieved using constant temperature hot-wire anemometry (CTA). A CTA system has a high frequency response and is capable of capturing the fluctuating flow field in a wind turbine wake. The result is detailed information about the turbulent statistics in the wake. This information will be used in the development of integrated numerical design tools for wind park planning.