Effect of Reynolds number and inflow parameters on mean and turbulent flow over complex topography - DTU Orbit (10/03/2019)

Effect of Reynolds number and inflow parameters on mean and turbulent flow over complex topography
A characterization of mean and turbulent flow behaviour over complex topography was conducted using a large-scale (1:25) model in the WindEEE Dome at Western University. The specific topographic feature considered was the Bolund Hill escarpment facing westerly winds. A total of eight unique inflow conditions were tested in order to isolate the impact of key parameters such as Reynolds number, inflow shear profile, and effective roughness, on flow behaviour over the escarpment.

The results show that the mean flow behaviour was generally not affected by the Reynolds number; however, a slight increase in speed-up over the escarpment was observed for cases with lower inflow roughness. The shape of the inflow wind shear profile also had a minor impact on the mean flow near the escarpment. More significant effects were observed in the turbulent flow behaviour, where the turbulent kinetic energy (TKE) over the escarpment was found to be a strong function of inflow roughness and a weak function of the Reynolds number. The local change in the inflow wind shear was found to have the most significant influence on the TKE magnitude, which more closely approximated the full-scale TKE data, a result which had not been previously observed in wind tunnel modelling of this topography.

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