Improved Inlet Conditions for Terrain CFD

The atmospheric boundary layer flow over different types of terrain is studied through simulations made with the finite volume CFD code of Ellipsys 2D and 3D. The simulations are compared to measurements made at the Høvsøre test site and over the hill of Askervein. The primary objective of these investigations is to find out, how the wind under neutral atmospheric stratification is affected by changes in the surface roughness. In both cases of Høvsøre and Askervein, an upstream roughness change is seen to have a significant influence on the observed flow. General empirical expressions are suggested for describing the flow after a change in the surface roughness. The derivation of these expressions is based on a range of simulations of flows over flat terrain with different types of roughness changes. The derived expressions show good agreement with simulations and could, as intended, be used to define inlet conditions for flow simulations over terrain, where an upstream roughness change is thought to have an influence. More thorough experimental verification is however, thought necessary to make the expressions sufficiently reliable. The same goes for the simulations-based conclusions regarding the flow over Askervein.