Subsets of measured wind data from the Hjardemål field experiment are extracted in order to produce test cases representing nearly stationary, neutral conditions with well defined upstream flow. Model solutions of the Reynolds Averaged Navier-Stokes (RANS) equations are obtained by utilizing the numerical flow solver EllipSys3D. When utilizing the well-known k-epsilon model as a turbulence closure, the result is a nearly complete agreement between the measurements and the model solution - not only for the forward flow but also for the separating backward flow over the Hjardemål escarpment. Small deviations can be understood from analyzing the conditions of the field experiment. It is of vital importance to understand the conditions under which the flow solver yields accurate solutions, in particular with respect to the grid generation, which was performed with the hyperbolic grid generator HypGrid2D/3D. The grid must allow the model to represent the underlying physics of the flow problem and the grid resolution must be sufficient to produce grid independent solutions. This yields not only the correct mean velocity but also the correct Turbulent Kinetic Energy (TKE). Deviations of the TKE in the zone very close to onset of separation might be understood by addressing the assumptions of a zero horizontal pressure gradient in the momentum balance near the surface. It is argued on basis of the obtained results that the model can be extended to non-neutral conditions and more complex terrain. The difficulties in using existing measurement data from a sparsely instrumented site, Porto, in complex terrain in Portugal for evaluating the model are demonstrated. Suggestions are offered to assist future field work incorporating wind measurements for complex terrain and nonneutral conditions in order to evaluate numerical flow models.