



Large-eddy Simulation of Atmospheric Boundary-layer Flow through a Wind Farm Sited on Complex Terrain

Sina Shamsoddin and Fernando Porté-Agel

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE (EPFL), WIRE, ENAC, Lausanne, Switzerland
(sina.shamsoddin@epfl.ch)

In this work, the performance of a wind farm situated on a hilly terrain is studied using large-eddy simulation and especial attention is paid to the effect of the topography on the wake flow characteristics. To this end, first, boundary-layer flow is simulated over a two-dimensional hill and the corresponding mean and instantaneous flow-field is captured. Subsequently, flow simulation through a wind farm, consisting of five horizontal-axis wind turbines, sited over the same hill in an aligned layout is performed and the resulting flow characteristics are compared with the former case, i.e. the case without wind turbines. To assess the validity of the simulations, the calculated results are compared with the measurements carried out by Tian et al. (2013) in the aerodynamic/atmospheric boundary layer wind tunnel of Iowa State University. The agreement between the simulation and experimental results is good in terms of mean velocity and turbulence intensity profiles at different streamwise positions.