ABSTRACT

Wind turbines sit at the very bottom of the atmospheric boundary layer, where winds are highly turbulent, shear events are intermittent, and land-surface interactions may be strong. Predictions of the stable boundary layer (SBL) are particularly challenging for wind energy resource assessment purposes, because the length scale of turbulent eddies is much smaller than under convective or neutral conditions, thus making it difficult to resolve and characterize the turbulence. Here we present an overview of simulations at real wind farms with complex terrain, including implementation of detailed models for turbine wake effects. The Weather and Research Forecasting (WRF) model is used here in grid nested configurations starting from the mesoscale (~10 km resolution) and ending with fine scale resolutions (~10 m) suitable for large-eddy simulation (LES) and comparison to field observations.