Microscale wind simulations using Reynolds Averaged Navier-Stokes (RANS) and Large-Eddy Simulation (LES) turbulence models are key for accurate wind resource assessment. The Barcelona Supercomputing Center utilizes these models to enhance wind farm modeling and operational forecast of high-resolution winds in complex terrains. Coupling mesoscale meteorological models (WRF) with Computational Fluid Dynamics (CFD) allows for detailed simulations that are crucial for the wind energy industry, particularly in assessing and predicting wind resource and operational conditions.