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Optimization of turbine spacing in the fully developed wind turbine array boundary layer[1] CHARLES MENEVEAU, Johns Hopkins University, Baltimore, MD, JOHAN MEYERS, Katholieke Universiteit Leuven, Belgium — We consider the fully developed wind turbine array boundary layer, which is a regime of relevance when wind farms exceed the height of the atmospheric boundary layer by over an order of magnitude. Based on extensive LES studies of such boundary layers, a simple physics-based parameterization of the effective surface roughness was developed [see Calaf et al. Phys. Fluids **22**, 015110 (2010)]. The model depends upon wind turbine spacing, height, loading factors, ground roughness, etc. Using this model for induced surface roughness of large wind-farms, we proceed to establish optimal spacings between wind turbines, considering constant imposed geostrophic wind forcing. We examine the dependence of the optimal spacing on the ratio between cost of wind turbine and of land surface. We find that optimal average turbine spacing typically is between ten and twenty rotor diameters. This spacing is considerably higher than that used in conventional wind farms.

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