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An improved effective roughness height model for optimization of wind farm layout[1] XIAOLEI YANG, FOTIS SOTIROPOULOS, St. Anthony Falls Laboratory, Department of Civil Engineering, University of Minnesota, 2 Third Avenue SE, Minneapolis, MN 55414, USA — An improved effective roughness height model is developed to account for the different effects of streamwise turbine spacing and spanwise turbine spacing, which cannot be well captured by the classic model when the ratio of streamwise spacing to spanwise spacing is not equal to 1. The central idea of the present model is approximating the nominal incoming velocity by a kinematic model, which is the time- and horizontal-averaged velocity at hub height in the classic model. The prediction capability of the present model is validated by comparing with the results from large-eddy simulation of infinite large aligned wind farms. The present model is also tested for finite-size wind farms and staggered wind farms.

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Xiaolei Yang
St. Anthony Falls Laboratory, Department of Civil Engineering,
University of Minnesota, 2 Third Avenue SE,
Minneapolis, MN 55414, USA

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