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Relationship between Anisotropy and Dispersive Stress in Wind Plants with Variable Spacing TAMARA DIB, NASEEM ALI, Portland State University, GERARD CORTINA, MARC CALAF, University of Utah, RAUL BAYOAN CAL, Portland State University — Large eddy simulations are considered for wind plants with varied spanwise and streamwise spacing. Data from five different configurations of staggered and aligned LES wind turbine arrays with a neutrally stratified atmospheric boundary layer are employed for analysis. For this study, the flow fields are analyzed by evaluating the anisotropy stress invariants based on the Reynolds shear stresses and dispersive stress tensor. The relationship between quantities are drawn as a function of the wind plant packing. Reynolds stresses and dispersive stresses are investigated alongside a domain altered version of the second and third scalar invariants, ξ, η, as well as the combination of the two invariants described by the function $F = 1 - 27\eta^2 + 54\xi^3$. F is a measure of the approach to either a two-component turbulence (F=1) or an isotropic turbulence (F=0). The invariant η describes the degree of anisotropy while ξ describes the characteristic shape. For the purposes of this study, the LES data is analyzed to understand the effects of canopy density on the anisotropy of dispersive stresses, adding further insight and detail for future modeling techniques.

Tamara Dib
Portland State University

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