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Impact of Aspect Ratio, Incident Angle, and Surface Roughness on Windbreak Wakes NICOLAS TOBIN, LEONARDO P. CHAMORRO, University of Illinois at Urbana-Champaign — Wind-tunnel results are presented on the wakes behind three-dimensional windbreaks in a simulated atmospheric boundary layer. Sheltering by upwind windbreaks, and surface-mounted obstacles (SMOs) in general, is parameterized by the wake-moment coefficient $\tilde{C}_h$, which is a complex function of obstacle geometry and flow conditions. Values of $\tilde{C}_h$ are presented for several windbreak aspect ratios, incident angles, and windbreak-height-to-surface-roughness ratios. Lateral wake deflection is further presented for several incident angles and aspect ratios, and compared to a simple analytical formulation including a near- and far-wake solution. It is found that $\tilde{C}_h$ does not change with aspect ratios of 10 or greater, though $\tilde{C}_h$ may be lower for an aspect ratio of 5. $\tilde{C}_h$ is found to change roughly with the cosine of the incident angle, and to depend strongly on windbreak-height-to-surface-roughness ratio. The data broadly support the proposed wake-deflection model.

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