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Scaling of Turbulent Flow through Model Building Canopies
H.J.S. FERNANDO, D. ZAJIC, Arizona State University — Flow and turbulence in building canopies continue to be a topic of profound interest in the context of pedestrian comfort, wind loading, contaminant dispersion and energy usage of populated urban areas. To this end, a new velocity scale of turbulence for flow through urban building canopies is derived in terms of the approach flow variables and canopy morphology. A control volume method is used for the derivation, together with known drag laws for individual building elements. An instrumented mock building cluster made of a regular array of simple man-sized objects (trailers), placed in the atmospheric boundary layer, is used to investigate the efficacy of the turbulent scale derived, and a good agreement is found. The flow adjustment at the leading and trailing edges of the canopy was found to be in general agreement with a formulation by Belcher, Jerram and Hunt (JFM, 488, 2003). The parameterizations resulted from this study have applications to developing simple and fast transport and dispersion models for predicting contaminant distribution in building canopies.

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