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Measurements of Roughness Length and Displacement Heights in Model Urban Canopies AUVI RAHMAN, PABLO HUQ, University of Delaware, FERNANDO CAMELLI, George Mason University, UD-GMU COLLABORATION — We present the results of roughness length and displacement height based on PIV velocity measurements in a water tunnel experiment of flow over idealized models of urban canopies. Experiments were conducted with large roughness elements of regular arrays of buildings of uniform height with aspect ratios of 1 and 3. Mean velocity profile above the canopy is described by the log law and a simple optimization procedure to compute the roughness length and displacement height has been developed. Laterally averaged values of displacement height d/H increase from 0 to 1 with plan area density λ_p of the urban canopy. In contrast, laterally averaged roughness height z_0/H increases to a maximum value (as λ_f approaches a value of 0.2) and then decreases to zero. We present data for effective roughness heights (z_0+d)/H as a function of aspect ratio H/w_b of buildings. This also reveals three categories of values: street canyon, building wake, and laterally averaged values. Measurements taken at the centerline of canyons form a lower bound on the effective roughness height whereas measurements behind building wakes form an upper bound. Laterally averaged values of friction velocity u_*/U_H varied inversely with the aspect ratio (U_H is the mean velocity at the building height).

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