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Aerodynamic Loads on Ground-Mounted Solar Panels: Multi-Scale Computational and Experimental Investigations

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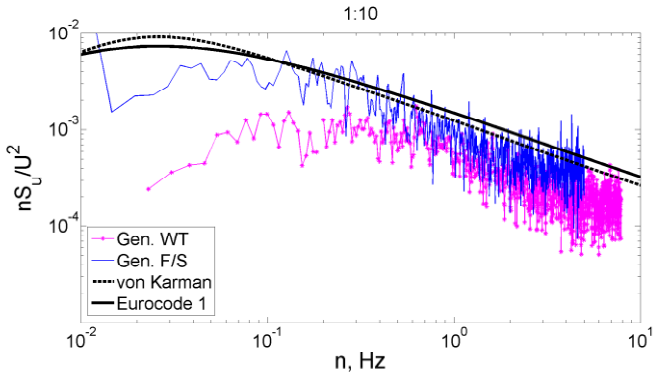
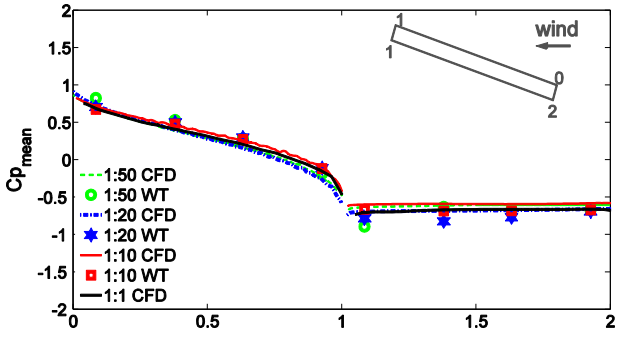
Abstract

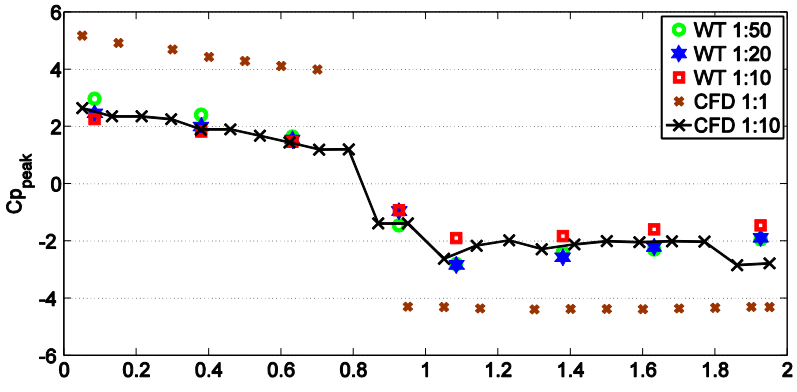
This paper presents experimental and computational fluid dynamics (CFD) investigations on ground-mounted solar panels with an aim to understand the model scale effects on the pressure distribution. Mean pressure coefficients are not significantly affected by the model size while peak pressures are alerted by both geometric model scale and inflow turbulence. There is an excellent agreement between the CFD and the experimental results. However, peak pressure coefficients derived from experimental testing (for a wide range of scales) are consistently lower compared to peak pressure coefficients generated using proper inflow with large eddy simulations (LES). This may be attributed to the lack of large eddies in the physical experiment.



(a)



(b)



(c)

Spectra of the input wind flows generated for the CFD simulations (a); mean (b) and peak (c) pressure coefficients on a centerline going around the upper and lower surfaces of a solar panel.