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Self-Similarity of Wakes in Wave-Driven Canopy Flow ROBERT ZELLER, FRANCISCO ZARAMA, JOEL WEITZMAN, JEFFREY KOSEFF, Stanford University — Wave-driven flow within a canopy is characterized by complex spatial heterogeneity caused by element wakes. Capturing this variability is difficult in numerical simulations and laboratory experiments because of computational cost and measurement access restrictions, respectively. In light of these issues, one way to account for horizontal variability is to assume that element wakes are self-similar. However, self-similarity depends on two conditions that are not necessarily satisfied in wave-driven canopy flows: 1) the wakes must be quasi-steady and 2) the wakes must be 2-D. In this study, phase-averaged particle image velocimetry measurements within a rigid canopy were used to evaluate the assumption of self-similarity. It was found to predict some flow statistics more accurately than others. In addition, the accuracy was found to be dependent on both the Keulegan-Carpenter number and the vertical location within the canopy. At low Keulegan-Carpenter number, the quasi-steady condition was violated because the wakes did not have time to develop. Near the top of the canopy, the 2-D assumption was violated because of the influence of the mixing layer.

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