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Quantifying the effect of inflow variability in RANS simulations of the JU2003 field experiment CATHERINE GORLE, CLARA GARCIA SANCHEZ, Von Karman Institute for Fluid Dynamics, DAVID PHILIPS, Cascade Technologies, Inc., GIANLUCA IACCARINO, Stanford University — Predicting flow and dispersion in realistic urban canopies is challenging because of the high variability in the governing flow parameters, such as atmospheric conditions and street-level geometrical characteristics. As a result, one deterministic prediction for a specific condition is unlikely to provide an adequate representation of the problem and uncertainty quantification is required to determine confidence bounds on the predictions. Assessing the predictive capability of the resulting model requires validation with field measurements that represent the full complexity of the problem. In this study we present a comparison of the JU2003 field measurements with computational results from RANS simulations performed within an uncertainty quantification framework. The variability in the inflow conditions observed during the field experiment is represented in the simulations, and regions in the urban canopy that are particularly sensitive to this variability are identified. The standard deviation in the results is compared to that observed during the field measurements. Three uncertain variables were considered: the velocity magnitude and direction and the aerodynamic roughness used in the log law that defines the incoming boundary layer profile. A sparse grid Clenshaw-Curtis Stochastic Collocation approach was used, and a polynomial chaos representation of the velocity at different field measurement locations was constructed to extract the mean and standard deviations.

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