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Defining boundary conditions for RANS predictions of urban flows using mesoscale simulations CLARA GARCIA SANCHEZ, von Karman Institute for Fluid Dynamics, CATHERINE GORLE, Columbia University, JEROEN VAN BEECK, von Karman Institute for Fluid Dynamics — Pollutant dispersion and wind flows in urban canopies are major concerns for human health and energy, and the complex nature of the flow and transport processes remains a challenge when using Computational Fluid Dynamics (CFD) to predict wind flows. The definition of the inflow boundary condition in Reynolds-Averaged Navier-Stokes simulations (RANS) is one of the uncertainties that will strongly influence the prediction of the flow field, and thus, the dispersion pattern. The goal of the work presented is to define a methodology that improves the level of realism in the inflow condition for RANS simulations by accounting for larger mesoscale effects. The Weather Research and Forecasting model (WRF) is used to forecast mesoscale flow patterns, and two different approaches are used to define inflow conditions for the RANS simulations performed with OpenFOAM: 1) WRF variables such as local velocity magnitude, ABL height and friction velocity are directly interpolated onto the boundaries of the CFD domain; 2) WRF predictions for the geostrophic wind and friction velocity are applied as a forcing boundary condition. Simulations of the Joint Urban 2003 experimental campaign in Oklahoma City have been performed using both approaches and a comparison of the results will be presented.

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