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Large-eddy simulation of turbulent dispersion from a localized source in a build-up environment BING-CHEN WANG, MOHAMMAD SAEEDI, Univ. of Manitoba — Turbulent dispersion from a continuous ground-level point-source within an array of 16x16 cubes has been simulated using wall-modelling large-eddy simulations. The major challenges associated with this problem involve obtaining a deeper understanding of the interaction of the dynamically evolving flow structures with the complex boundary conditions, coupling of the momentum and scalar transport processes, and a high Reynolds number tested for an modeled urban atmospheric boundary layer (Re=12,005 based on the free stream velocity and obstacle height). A fully-parallelized in-house computer code was used for performing the simulation. An advanced dynamic nonlinear model (DNM) and dynamic full linear eddy diffusivity model (DFLTDM) have been used for closure of the filtered momentum and scalar transport equations, respectively. A non-equilibrium thin boundary-layer wall model is applied to all solid surfaces. Inlet boundary conditions based on solid grids have also been investigated in order to generate high turbulence levels typical for an approaching urban atmospheric boundary-layer flow. The predicted results for the flow and concentration field have been thoroughly validated against a set of high-quality water-channel measurement data.

Bing-Chen Wang
Univ. of Manitoba

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