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# Evaluating the Validity of CFD Model of Dispersion in a Complex Urban Geometry Using Two Sets of Experimental Measurements

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**Abstract :** This research presents the validation study of a computational fluid dynamics (CFD) model developed to simulate the scalar dispersion emitted from rooftop sources around the buildings at the University of Alberta North Campus. The ANSYS CFX code was used to perform the numerical simulation of the wind regime and pollutant dispersion by solving the 3D steady Reynolds-averaged Navier-Stokes (RANS) equations on a building-scale high-resolution grid. The validation study was performed in two steps. First, the CFD model performance in 24 cases (eight wind directions and three wind speeds) was evaluated by comparing the predicted flow fields with the available data from the previous measurement campaign designed at the North Campus, using the standard deviation method (SDM), while the estimated results of the numerical model showed maximum average percent errors of approximately 53% and 37% for wind incidents from the North and Northwest, respectively. Good agreement with the measurements was observed for the other six directions, with an average error of less than 30%. In the second step, the reliability of the implemented turbulence model, numerical algorithm, modeling techniques, and the grid generation scheme was further evaluated using the Mock Urban Setting Test (MUST) dispersion dataset. Different statistical measures, including the fractional bias (FB), the geometric mean bias (MG), and the normalized mean square error (NMSE), were used to assess the accuracy of the predicted dispersion field. Our CFD results are in very good agreement with the field measurements.

**Keywords :** CFD, plume dispersion, complex urban geometry, validation study, wind flow
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