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# Turbulent and photochemical processes in a deep street canyon – a Large-Eddy Simulation

J. Zhong, X. M. Cai, and W. J. Bloss
University of Birmingham, United Kingdom (zxj160@bham.ac.uk)

A street canyon is a typical narrow site in the urban area with buildings along both sides of the street. Released from the ground level, traffic emissions (e.g. $NO_x$,VOCs and CO) are dominant air pollutant sources into urban street canyons where air ventilation is very poor. Air pollutant concentrations within a street canyon are determined by the mixing with the background air, vehicular emissions and photochemical processing of air pollutants. In this study, the Large-Eddy Simulation (LES) methodology coupled with chemical mechanisms is developed at the University of Birmingham to investigate characteristics of turbulent mixing and photochemical processes in a deep street canyon (e.g. with H/W=2) using the Computational Fluid Dynamics (CFD) software package (OpenFOAM). The preliminary results show that the concentrations of air pollutants vary significantly in space and time within the street canyon due to the existence of unsteady multiple vortices. High levels of pollutants can occur at the pedestrian height at both leeward and windward sides. There is also evidence of separated chemical regimes in the deep canyon: the top part of canyon significantly affected by the background chemical composition and the bottom part significantly affected by the emissions. This study can provide a better understanding of the segregation effects caused by the multiple vortices on the nonlinear photochemical processes and the characteristics of air pollution within a deep street canyon.