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NUMERICAL UNCERTAINTIES IN THE COMPUTATION OF THE FLOW IN 2D STREET CANYONS

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Computers have significantly improved in the last decade with regards to computing speed, main memory and storage capacity. Nowadays 3D computations of statistically steady turbulent flow and dispersion in complex urban geometries are routinely performed on desktop computers. Like ten years ago these computations are often approaching the hardware limits which did merely expand substantially until today. Contrary to this the present computing power is used in this work to re-examine the computation of the flow in a simple 2D street canyon by obtaining and analysing quantitative information on the numerical errors. The 2D street canyon case was chosen for its simplicity and the fact that it has been studied already numerous times. However, for all these previous results only limited estimates of the influence of the numerical parameters on the velocity and concentration fields are available. Therefore several of these previous simulations are repeated in the present work to analyse the dependence of the numerical velocity results on the numerical approximations of the convective terms in the statistically steady Reynolds Averaged Navier Stokes (RANS) equations, on the convergence criteria used for termination of the iterative solution and on the spatial resolution of the grid. For the last point the spatial discretisation error is estimated with the aid of generalised Richardson extrapolation, using iteratively fully converged results on three systematically refined grids. In this way previous results are either confirmed or questioned, based on the present results, which contain complete quantitative information on the numerical errors. It is hoped that the results will help in promoting a closer look at the numerics to further improve the quality in dispersion modelling.