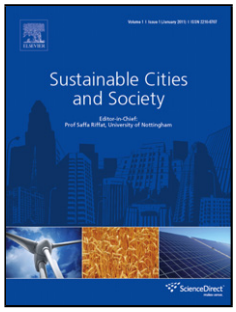

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PII: S2210-6707(18)30425-6
DOI: https://doi.org/10.1016/j.scs.2018.08.012
Reference: SCS 1210

To appear in:

Received date: 7-3-2018
Revised date: 11-8-2018
Accepted date: 12-8-2018

Please cite this article as: Ricci A, Kalkman I, Blocken B, Burlando M, Freda A, Repetto MP, Large-scale forcing effects on wind flows in the urban canopy: impact of inflow conditions, *Sustainable Cities and Society* (2018), https://doi.org/10.1016/j.scs.2018.08.012

Large-scale forcing effects on wind flows in the urban canopy: impact of inflow conditions

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Highlights

- Wind-tunnel tests and CFD simulations have been performed on a reduced-scale urban model.
- The impact of different sets of inflow conditions has been quantified.
- Mean wind velocity profiles, turbulent kinetic energy profiles and yaw and pitch angles of wind-tunnel test and CFD simulations have been compared.
- The agreement between wind-tunnel and numerical results has been quantified using four validation metrics.

Abstract:

Wind flow modeling in urban areas is usually performed by means of Wind-Tunnel (WT) testing or Computational Fluid Dynamics (CFD) simulations. Results obtained with both techniques can be affected by the boundary conditions. This study aims at investigating how two sets of inflow conditions, termed *set 1* and *set 2* and calculated respectively using the equations proposed by Tominaga et al. (2008) and Richards and Hoxey (1993), may affect the accuracy of the results in terms of mean wind speed, turbulent kinetic energy, yaw and pitch angles when predicting wind flows in urban areas. 3D steady RANS simulations were performed for a selected urban area ("*Quartiere La Venezia*" in Livorno, Italy). WT tests on the same urban model were used to validate the CFD simulations. Mean wind profiles at 25 positions in the urban area were compared and the statistical performance was quantified using four metrics for both sets of inflow conditions. The results obtained using the two sets of inflow conditions showed comparable performances in terms of wind flow predictions in the urban