1.091 Improvement on urban scale meteorological and air quality simulation: using local urban canyon parameters and models.

Early Career Scientist

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Abstract:

Urban meteorological conditions and air quality becomes more and more difficult to be accurately reproduced by modelling tools due to rapid and complex changes in land use and land cover induced by urbanization in recent decades. In this study, in order to define the detailed urban morphology, the Remote Sensing (RS) and Geographic Information System (GIS) techniques are combined to develop high-resolution gridded Urban Canyon Parameters (UCPs) in Beijing, China. Four different urban canyon schemes with or without UCPs, coupled with The Weather Research and Forecasting (WRF) model and the Community Multiscale Air Quality (CMAQ) model, are used to explore the best selection of appropriate urban parameters and schemes for climate and air quality simulation: (1) Bulk simple scheme; (2) a single-layer urban canopy (SLUCM); (3) a multilayer urban canopy scheme (BEP); (4) BEP coupled with a simple building energy model (BEP + BEM). The results show that, compared with observations, the application of local UCPs in all urban canyon models has obviously improved the accuracy of urban meteorological, especially for the 10-m wind speed, and air quality predictions. The best performances for $PM_{2.5}$ and ozone simulation are obtained in BEP and BEP+BEM scenarios, where the underestimation in July is significantly reduced, mainly because of the higher prediction for PBLH. Our results proved that although more computation time is needed, the local UPCs database and urban canyon models are both necessary configurations for urban-scale modelling.