Influence of Urban Canopy Layer on a heavy rainfall over Beijing

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Urban canopy layer (UCL) is generally considered in numerical study of urban meteorology. The weather research and forecasting Model (WRF) coupled with urban canopy layer scheme is used to simulate a heavy rainfall case in Beijing. Comparative analysis is applied for the case between coupled simulation and non coupled simulation and therefore exhibits the effect of the UCL on the rainfall. Sensitive experiments are performed to investigate anthropogenic heat source and urban area extension to affect the precipitation. The results show that the coupled UCL model has captured the rainfall characteristics at the regional scale. The coupled simulation has improved accuracy of the rainfall area, the peak value and the rainfall duration compared to the non coupled simulation. The main effect achieves as longer duration of the ascending motions and enhancement of the layers unstabilities. Although the intensity of the vertical motion has a little reduction, the time of the motion has increased 2 hours in a day. Sensitive experiments present an obvious influence on precipitation intensity, precipitation centralization and heat island effect. The precipitation center moves toward the urban center, the accumulated rainfall increases 78.5 mm and the center moves by distance 13 km when anthropogenic heat source is perturbed to double. Urban area extension induces increase of the precipitation area and intensity due to high humidity and ascending motion. The experiment also reveals shift of the island heat effect.