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Simulation of Downstream Effects of Urbanization on Cloud and Precipitation with WRF Model in Yangtze River Delta, China

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Urbanization, one of the extreme cases of land-use change, plays an important role in modifying precipitation and urban hydrology. In this study, urbanization effect on cloud and precipitation in the Yangtze River Delta of China is simulated using Weather Research and Forecasting (WRF) model coupled with a single-layer Urban Canopy Model(SLUCM). Based on the 4-summer simulation results from 2011 to 2014, we find that the influence of cities on clouds and precipitation is obviously affected by wind field. During the day, more cloud on higher level and precipitation occurs in urban area and downwind region of urban, induced by more unstable urban air transported downstream, which enhances vertical mixing and updraft moisture transport. At night, the urban dry island become the dominant factor, resulting in the decrease of cloud occurrence in the urban and downstream areas. The downstream effects of urbanization on cloud and precipitation turn out to be strongly related to the moisture and convective conditions.