Numerical studies of urban heat island effects and its mitigation in Yangtze River Delta, China

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Yangtze River Delta is one of the most urbanized area in China, which has been experienced a very quick urbanization processes in the recent decades. Weather Research and Forecasting model (WRF) coupled with a single-layer urban canopy model is used to investigated the influence of urbanization in different scales, from a single city to regional area. The results show that the near-surface temperature increases during the urbanization processes and urban heat island (UHI) circulation enhances the local lake breeze circulation in the daytime and weakens it at night. Horizontal convection rolls may occur in the downwind area of cities. The background south-east wind in summer may cause an ‘upwind UHI impact’ in this area. The downwind city experienced a stronger UHI than the windward city, because the warm air is transported from the windward city to the downwind one. This may increases the downwind UHI intensity by 20% at night, while it increases the atmospheric boundary layer stability over the downwind city in the daytime. The urbanization processes in this area not only impact local urban climate but also have influence on regional climate in Yangtze River Delta. The urbanization process increases the near-surface temperature, UHI intensity, decreases the diurnal temperature variation range, near-surface wind speed and humidity. The influences on UHI and near-surface temperature are greater in summer than in winter due to the background climate characteristics. The effectiveness of two urban heat island mitigation methods (cool roof and green roof) are also discussed using the WRF model.

Biography
Ning ZHANG is a professor at School of Atmospheric Sciences, Nanjing University, China and he is now serving as the head of Department of Atmospheric Physics and Atmospheric Environment. He did his postdoctoral research at Jackson State University. He has published more than 50 research articles and book chapters in boundary layer meteorology and urban climate fields. He has been serving as an editorial board member of Urban Climate.