Detection of urbanization signals in extreme winter minimum temperature changes over Northern China

Qingxiang Li (1) and Jiayou Huang ()

(1) China Meteorological Administration, National Meteorological Information Center, Beijing, China (liqx@cma.gov.cn), (2) Peking University

Although previous studies show that urbanization contributes to less than 10% of the long-term regional total warming trend of mean surface air temperature in northeast China (Li et al. 2010), the urban heat island (UHI) impact on extreme temperatures could be more significant. This paper examines the urbanization impact on extreme winter minimum temperatures from 33 stations in North China during the period of 1957–2010. We use the Generalized Extreme Value (GEV) distribution to analyze the distribution of extreme minimum temperatures and the long-term variations of the three distributional characteristics parameters. Results suggest that among the three distribution parameters, the position parameter is the most representative in terms of the long-term extreme minimum temperature change. A new classification method based on the intercommunity (factors analysis method) of the temperature change is developed to detect the urbanization effect on winter extreme minimum temperatures in different cities. During the period of rapid urbanization (after 1980), the magnitude of variations of the three distribution parameters for the urban station group is larger than that for the reference station group, indicating a higher chance of occurrence of warmer weather and a larger fluctuation of temperatures. Among different types of cities, the three parameters of extreme minimum temperature distribution of the urban station group are, without exception, higher than those of the reference station group. The urbanization of different types of cities all show a warming effect, with small-size cities have the most evident effects on extreme minimum temperatures.