Analysis of the impact of geographic features, population distribution and power load on heat island effects in the metropolis of Shenzhen

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ABSTRACT. Based on the air temperature data collected from automated weather stations, the urban heat island (UHI) intensity in Shenzhen metropolis is calculated and the impact of several factors, including land-sea distribution, population density, road coverage area and power load, on the UHI intensity are analyzed. The analysis shows that the land-sea distribution is the dominant factor for the UHI distribution in Shenzhen, with the climate-adjusting effect of the sea clearly reducing the UHI intensity in the east and west parts of Shenzhen. The middle part of Shenzhen is adjacent to Hong Kong and the climate-adjusting effect of the sea is weak, which leads to UHI intensity being centered around this area. The population density and road coverage area do impact the UHI in Shenzhen, with strong dependency between the UHI intensity and the two factors (p < 0.01). However, in the area with the densest roads, the UHI intensity is not high, which may be related to the high yearly-average wind speed in this area. Comparing the data from 2011 and 2010 shows strong impact of the power load on the UHI intensity in Shenzhen, and the increase of the UHI intensity in 2011 is highly likely to be due to the increase of the power load in the colder winter and the hotter summer of 2011.

Key words – Urban heat island, Land-sea distribution, Population density, Road coverage area, Power load.