LAND SURFACE TEMPERATURE VARIATION AND ITS NON-STATIONARY RELATIONSHIP WITH ENVIRONMENTAL FACTORS IN SHENZHEN, CHINA

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ABSTRACT: Variation of land surface temperature (LST) in urban areas is correlated with environmental factors and their complex interaction has been explored with the help of satellite thermal infrared images by numerous studies. However, current studies mainly focused on the impact of land use/cover (LULC) on LST at the whole city scale, ignoring the fragmented and complex intrinsic of the urban ecosystem. Actually, the relationships between LST and environmental factors are spatial non-stationary and scale-dependent. Based on this point, 61 census tracts in Shenzhen, china are employed as the basic statistical units to explore the spatial non-stationary relationships between LST and environmental factors. In this study, environmental factors include land use/cover type, normalized difference building index (NDBI), impervious surface area (IMA) and normalized difference vegetation index (NDVI). Both LST and LULC data are retrieved from a Landsat ETM+ image. A geographically weighted regression (GWR) model is employed. For reference, ordinary least squares (OLS) model is also employed using the same response variable (LST) and explanatory variables as GWR model. Results indicate that spatial variation of LST is obviously correlated with land use/cover types, with higher LST in residential and transport land; lower LST in vegetated areas, e.g. garden, woodland, cropland and water. The slopes of NDVI and NDBI derived from GWR model exhibit significant and similar regional differentiation, with an increase from west to east. The importance of IMA is increasing from north-west to south-east. Compared with OLS, the explanatory power of GWR model is stronger, with higher R-Squared values, smaller residual values and AICc. Overall, LST is affected by geographical factors over varied spatial scales in Shenzhen, China. GWR model has the advantages of describing scale effects of non-stationary relationships. The findings are helpful to improve urban planning for mitigating the effect of urban heat islands.