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Spatial Heterogeneity of Urban Land Use in the Yangtze River Economic Belt Based on DMSP/OLS Data

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Abstract : Taking the Yangtze River Economic Belt as an example, using long-term nighttime lighting data from DMSP/OLS from 1992 to 2012, support vector machine classification (SVM) was used to quantitatively extract urban built-up areas of economic belts, and spatial analysis of expansion intensity index, standard deviation ellipse, etc. was introduced. The model conducts detailed and in-depth discussions on the strength, direction, and type of the expansion of the middle and lower reaches of the economic belt and the key node cities. The results show that: (1) From 1992 to 2012, the built-up areas of the major cities in the Yangtze River Valley showed a rapid expansion trend. The built-up area expanded by 60,392 km², and the average annual expansion rate was 31%, that is, from 9615 km² in 1992 to 70007 km² in 2012. The spatial gradient analysis of the watershed shows that the expansion of urban built-up areas in the middle and lower reaches of the river basin takes Shanghai as the leading force, and the 'bottom-up' model shows an expanding pattern of 'upstream-downstream-middle-range' declines. The average annual rate of expansion is 36% and 35%, respectively. 17% of which the midstream expansion rate is about 50% of the upstream and downstream. (2) The analysis of expansion intensity shows that the urban expansion intensity in the Yangtze River Basin has generally shown an upward trend, the downstream region has continued to rise, and the upper and middle reaches have experienced different amplitude fluctuations. To further analyze the strength of urban expansion at key nodes, Chengdu, Chongqing, and Wuhan in the upper and middle reaches maintain a high degree of consistency with the intensity of regional expansion. Node cities with Shanghai as the core downstream continue to maintain a high level of expansion. (3) The standard deviation ellipse analysis shows that the overall center of gravity of the Yangtze River basin city is located in Anqing City, Anhui Province, and it showed a phenomenon of reciprocating movement from 1992 to 2012. The nighttime standard deviation ellipse distribution range increased from 61.96 km² to 76.52 km². The growth of the major axis of the ellipse was significantly larger than that of the minor axis. It had obvious east-west axiality, in which the nighttime lights in the downstream area occupied in the entire luminosity scale urban system leading position.

Keywords : urban space, support vector machine, spatial characteristics, night lights, Yangtze River Economic Belt
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