

Identifying the cities and towns in 30 China' s metropolitan areas and analyzing the hierarchical structures

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With the rapid urbanization in the past 40 years, a series of metropolitan areas emerged around the megacities or large cities in China and these metropolitan areas have been playing important roles in driving regional development. In order to grasp the basic hierarchical structure characteristics of cities and towns in different metropolitan areas, it is necessary to define the scopes of metropolitan areas and identify the key cities and towns within the metropolitan areas. The study aimed to analyze the hierarchical structures of cities and towns in 30 China' s metropolitan areas based on the LuoJia 1 Nighttime Light Imagery.

Firstly, the basic framework using local contour tree algorithm to identify the key cities and towns in the metropolitan areas was presented. Secondly, based on the defined built-up areas of the key cities and towns, with consideration of the concerned population data, the key cities and towns were classified into the core cities, node cities, secondary node towns and micro centers within the metropolitan areas. Then, the hierarchical structures of cities and towns in 30 China' s metropolitan areas were analyzed by using three parameters as the numbers of cities and towns except core cities, the equilibrium of key cities and towns, the aggregation of key cities and towns.

As the results, the following characteristics were indicated. 1) The presented method identifying the key cities and towns could be used to accurately delimit the actual urban spatial scope without considering the divisions of administrative boundaries. 2) 30 metropolitan areas were found to have large population scales in the built-up areas and most of 30 metropolitan areas shown the structures with a single core. 3) In some metropolitan areas, the hierarchical structures of key cities and towns were not perfect due to the lacks of some levels. The results indicated that the radiation capacities of core cities were insufficient and the key roles of node cities and secondary node cities were limited. 4) 30 major metropolitan areas could be divided into six types, which were single core type, single center type, double centers type, multi-centers type, cluster type and network type.

Keywords: metropolitan area, key cities and towns, hierarchical structure, local contour tree algorithm, LuoJia 1 Nighttime Light Imagery