Under the rapid urbanization and industrialization, the spatial structure (composition) and intensity of land use/cover (LULC) have drastically transformed over the past decade, especially in China (Wang & Murayama, 2017). In this connection, the urban heat island (UHI) phenomenon has become increasingly serious and caused excessive energy consumption, air pollution, and living environmental deterioration. Therefore, it is important to scientifically evaluate and predict the impact of accelerating urbanization on UHI formation, by examining the relationship between land surface temperature (LST) and LULC pattern. The issue on UHI formation is crucial for healthy urban sustainable development in China.

In this study, taking Nanjing city, the capital of Jiangsu province, as a study area (Fig. 1), an attempt is made to investigate the changes of LULC from 2000 to 2018 and analyze the LST changes in different LULC categories. The goal is to support urban planning initiatives and sustainable development policy by conducting the sophisticated simulation analysis of the LULC and LST distribution in 2030 and 2050, respectively. By combining the techniques of remote sensing and geography information system, the geospatial analysis with the Landsat data is employed here to attain this purpose.

The ArcGIS and TerrSet software are adopted for classifying LULC and examining LST changes in each LULC category at a very variety of spatial scales. The Landsat data of three-time points (2000, 2014 and 2018) are selected to prepare LULC maps and LST in Nanjing city. The UHI phenomena in Nanjing city is examined through the interpretation of the LST and LULC maps. Finally, I try to simulate and visualize the LULC distribution in 2030 and 2050 and then to discuss the relationship with LST pattern based on the thermal radiation character in each LULC type.

The results show that the built-up area has expanded from the CBD to the suburban area, and the strong UHI phenomena have been observed in Nanjing city from 2000 to 2018. The LST in the central area has been significantly higher than those in the other areas, which has brought about not only serious environmental problems, but also uncomfortable health conditions.

In conclusion, the mitigation measure and practice of the increasing UHI effect will be necessary in near future. The appropriate urban land use policy and planning are essential for the sustainable urban development in Nanjing city.

Fig. 1. LULC map in 2014, Nanjing city, China