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Explanatory Analysis the Effect of Urban Form and Monsoon on Cooling Effect of Blue-Green Spaces: A Case Study in Singapore

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Abstract : Rapid urbanization has caused the urban heat island effect, which will threaten the physical and mental health of urban dwellers, and blue-green spaces can mitigate the thermal environment effectively. In this study, we calculated the average LST from 2013 to 2022, Northeastmonsoon and Southwestmonsoon of Singapore, and compared the cooling effect differences of the four blue-green spaces. Then, spatial correlation and spatial autoregression model were conducted between cooling distance intensity (CDI) and 11 independent variables. The results reveal that (1) the highest mean land surface temperature (LST) in all years, Northeast monsoon and Southwest monsoon can reach 42.8 ℃, 41.6 ℃, and 42.9 ℃, respectively. (2) the temperature-changing tendency in the three time periods is similar to each other, while the overall LST changing trends of the Southwest monsoon are lower than all year and Northeast monsoon. (3) the cooling distance of the sea can reach 1200 m, and CEI is highly positively correlated with NDBI and BuildD and highly negatively correlated with SVF, NDVI and TreeH. LISA maps showed that the zones that passed the significance test between CDI, NDBI and BuildD were nearly the same locations; the same phenomenon also happened between CDI and SVF, NDVI and TreeH. (4) SLM had better regression results than SEM in all the regions; only 3 independent variables passed the significance test in region 1, and most independent variables can pass the significance test in other regions. Variables DIST and NDBI were significantly affecting the CDI in all the regions. In the whole region, all the variables passed the significance test, and NDBI (1.61), SVF (0.95) and NDVI (0.5) had the strongest influence on CDI.

Keywords : cooling effect, land surface temperature, thermal environment mitigation, spatial autoregression model
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