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Using Geo-Statistical Techniques and Machine Learning Algorithms to Model the Spatiotemporal Heterogeneity of Land Surface Temperature and its Relationship with Land Use Land Cover

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Abstract : In metropolitan areas, rapid changes in land use and land cover (LULC) have ecological and environmental consequences. Saudi Arabia's cities have experienced tremendous urban growth since the 1990s, resulting in urban heat islands, groundwater depletion, air pollution, loss of ecosystem services, and so on. From 1990 to 2020, this study examines the variance and heterogeneity in land surface temperature (LST) caused by LULC changes in Abha-Khamis Mushyet, Saudi Arabia. LULC was mapped using the support vector machine (SVM). The mono-window algorithm was used to calculate the land surface temperature (LST). To identify LST clusters, the local indicator of spatial associations (LISA) model was applied to spatiotemporal LST maps. In addition, the parallel coordinate (PCP) method was used to investigate the relationship between LST clusters and urban biophysical variables as a proxy for LULC. According to LULC maps, urban areas increased by more than 330% between 1990 and 2018. Between 1990 and 2018, built-up areas had an 83.6% transitional probability. Furthermore, between 1990 and 2020, vegetation and agricultural land were converted into built-up areas at a rate of 17.9% and 21.8%, respectively. Uneven LULC changes in built-up areas result in more LST hotspots. LST hotspots were associated with high NDBI but not NDWI or NDVI. This study could assist policymakers in developing mitigation strategies for urban heat islands

Keywords : land use land cover mapping, land surface temperature, support vector machine, LISA model, parallel coordinate plot
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