



EVALUATION OF DAY AND NIGHT LAND SURFACE TEMPERATURE WITH IMPERVIOUS SURFACE USING MODIS SATELLITE DATA

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ABSTRACT:

The occurrence of higher temperatures in urban areas as compared to the neighbouring rural or suburban areas is referred to as Urban Heat Island (UHI). As one of the crucial variables for quantifying urban surfaces, impervious surfaces can be considered as an important parameter for the study of UHI effect. The behaviour of day and night Land Surface Temperature (LST) is found to vary for different land covers. Previous studies have shown the correlation of LST with percent impervious surface but the diurnal variation of this relation is not yet clearly understood due to limited studies. The present study investigates the diurnal relation of Moderate Resolution Imaging Spectroradiometer (MODIS) LST with percent impervious surfaces in Varanasi, India for three different seasons of the year 2017. Percentage impervious was determined using linear spectral mixture analysis using Landsat 8 Operational Land Imager (OLI) data and then aggregated to the spatial resolution of MODIS data. Then the relation of day and night MODIS LST with percentage impervious surface was determined for different seasons. The natural land cover in the surrounding rural areas varies with change in season. In our analysis, night LST was observed to show strong linear relationship with percent impervious surface for all the seasons ($R^2 = 0.84, 0.78$ and 0.81 for winter, summer and post monsoon respectively) but the day LST do not show good correlation and also varies with seasons ($R^2 = 0.81, 0.03$ and 0.18 for winter, summer and post monsoon respectively). The impervious surfaces show higher LST than the natural land covers during night time which results in good correlation. The pervious surfaces of vegetation and water show lower LST whereas bare land shows higher LST than impervious surfaces which results in lower correlation of day LST with percent impervious. Therefore, the good correlation of percent impervious surface with night LST makes it suitable for the study of surface UHI effect quantitatively over the seasons.

KEYWORDS: Impervious surface, LST, MODIS, UHI, linear spectral mixture analysis