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Analysis of Relationship between Land use/cover and Urban Heat Island using ETM+

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Abstract

An urban heat island (UHI) indicating an area of the surface that is relatively warm; most commonly associated areas of human disturbance such as towns and cities. The cause of such a phenomenon is distributed in two major components. One factor is the change of land cover. Vegetation and water areas that play an important role in alleviating the rise of air temperature are decreased and artificial land covers that have high heat capacity are increased like asphalt and concrete. Furthermore the emission from automobile and artificial cooling has been increasing recently in urban area. Now, there are lots of studies dealing with these topics, but the studies from the viewpoint of quantity are not enough. In this research the urban heat islands of Tehran (Capital city of Iran) as the most important population center and one of the most important industrial center of Iran is investigated.

This work aims to investigate the relationship between land cover proportions and UHI with ETM+ images of Tehran. To achieve this aim, for mapping land surface materials with distinct physical properties from Landsat ETM+, linear spectral unmixing method was utilized for end member fraction estimation. The transformed ETM+ image was unmixed into four fraction images (vegetation, soil, high albedo and low albedo). Impervious surface was then computed from the high and low albedo images. Multiple regression models were further developed to reveal how land surface temperature is related to urban biophysical descriptors (i.e. impervious surface, green vegetation, and soil).

Results indicate that impervious surface because of high heat capacity and anthropogenic heat emissions into the air and dry soil through high heat capacity was positively correlated while vegetation was negatively correlated with land surface temperature. Also industrial area has the most positively correlated with land surface temperature because the anthropogenic heat flux is high in industrial areas.

Key words: LST1, linear spectral immixing; Urban heat island (UHI); V–I–S model.