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技术方法

基于Landsat TM的城市热岛效应与地表特征参数稳健关系模型

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摘要：

首先，利用Landsat TM热红外影像结合地面气象观测资料反演地面温度，揭示了济南市夏季城市热岛效应| 然后，基于稳

健的LTS与最小二乘回归（LS）分析探讨了城乡地面热辐射与地表特征参数的线性变化趋势，认为植被指数（NDVI、SAVI和TCG）、

湿度指数（NDMI和TCW）以及近红外反照率与地表温度的变化趋势相反，亮度指数（NDBI和TCB）和可见光反照率与地表温度的变化

趋势一致，而短光波段反照率与地表温度不存在明显相关趋势。研究结果表明，NDMI能很好地解释地表温度变化，且最为稳健；

其次是NDVI、SAVI、TCG和NDBI，它们对地表温度的解释程度高且稳健性较强； 可见光反照率虽能较好解释地表温度，但其稳健性

较差； 近红外反照率、TCW和TCB对地表温度的解释程度和稳健性相对较低。

关键词： 热红外遥感 植被指数 湿度指数 亮度指数 反照率

THE ROBUST LINEAR REGRESSION MODEL BETWEEN SATELLITE-DERIVED URBAN HEAT ISLAND AND UNDERLYING SURFACE PARAMETERS

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Abstract:

Using Landsat TM imagery, the author investigated urban surface temperature and its relationship with

such underlying surface parameters as NDVI, SAVI, NDBI, NDMI, Tasseled Cap Brightness (TCB), Greenness (TCG) and

Wetness (TCW), total shortwave albedo, and visible and near-IR broadband albedos in Jinan City, Shandong province.

The results show that the mean land surface temperature (Ts) in the built-up areas is 11.04℃, higher than that in

the suburban areas. Simple linear models between landcover parameters and Ts derived from Landsat TM thermal image

were built by using robust LTS regression and classic least-squares regression. Ts is negatively correlated with

vegetation indices (NDVI, SAVI and TCG), wetness indices (NDMI and TCW) and near-IR broadband albedo and

positively correlated with brightness indices (NDBI and TCB) and visible broadband albedo at the

significant level

of α=0.05. However, simple linear relationship between Ts and total shortwave albedo does not exist. Most of the

regression models have high fitness score, except only for the two models associated with TCW and TCB. It is

also shown that the linear regression model between NDMI and Ts is most robust, while the regression equations

associated with visible and near-IR broadband albedo, TCW and TCB are not robust.

Keywords: Thermal remote sensing Vegetation index Wetness index Greenness index Broadband albedo

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