

Retrieval of Land Surface Temperature from Landsat TM images based on V-I-S and V-W-S Model in Poyang Lake Area

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Abstract:

Land surface temperature (LST) plays an important role in the study of land surface energy balance (LSEB). The accuracy of LST has cast much influence on the improvement of LSEB. Thereinto, the retrieval of land surface emissivity from remotely sensed images is the main difficulty in the determination of LST, especially for the mixed pixels. Therefore, spectral mixture analysis is introduced for the retrieval of land surface emissivity. In this study, Poyang lake area is selected as the study area, where is covered by the maximum lake wetland in China. For the medium resolution images, the land mixed pixels are mainly comprised by vegetation, impervious layer and soil and wetland mixed pixels are mainly comprised by vegetation (chlorophyl), water and soil (sediment). So vegetation, impervious layer and soil (V-I-S) model and vegetation, water and soil (V-W-S) model are used to derive land surface emissivity.

Firstly, water and land areas are mapped from Landsat TM images. Secondly, spectral characteristic of vegetation, impervious layer, soil and water are derived from Landsat images and ASTER spectral library, and then linear V-I-S and V-W-S model are employed for land and water areas respectively. Thirdly, the endmember equivalent emissivity is calculated from ASTER spectral library. Fourthly, the linear spectral mixture model (LSMM, $R(\lambda) = f_1R_1(\lambda) + f_2R_2(\lambda) + f_3R_3(\lambda)$, Where f_i represents the component of different end-members, $R(\lambda)$ represents the observed radiance.) is used for the retrieval of land surface emissivity. Similarly, pixel emissivity could be expressed as $\varepsilon = \varepsilon_i f_i$, where ε is pixel emissivity, ε_i is the

emissivity of endmembers and f_i is the component of different endmembers. Finally, pixel emissivity's value is involved in the radiance transfer equation (Artis and Carnahan, 1982) to derive LST.

Results of the proposed method emphasize the difference of different land use/cover types, which will fulfill the study of LSEB and ecology analysis.

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