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- By Issue
- By Author
- By Title

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Spatially Distributed Watershed Mapping and Modeling: Thermal Maps and Vegetation Indices to Enhance Land Cover and Surface Microclimate mapping (part 1)

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Abstract

The extent and type of watershed cover affects the movement of water in the hydrologic cycle, thus accurate representation of the physical and

biological features of the landscape within the watershed is required. Satellite imagery from Landsat and other satellites provide land cover and surface microclimate information with high temporal and spatial accuracy. The use of these data to understand hydrologic processes depends on how accurately they are interpreted and mapped. This paper utilizes the surface radiant temperatures derived from the thermal band of Landsat images and vegetation indices derived from visible, near-infrared, thermal and midinfrared spectrums to further improve land cover and surface microclimate mapping. The study was done on three watersheds in Florida having mean area of 420 km2. Landsat images from 1984 and 2000 were processed using an unsupervised classification. Calibrated surface radiant temperatures and vegetation indices, which indicate a strong relationship with the ground truth data, were identified using scatter diagrams. Surface microclimate (pixel scale) parameters (percent vegetation cover, scaled surface temperature) were determined and their spatial and temporal distributions were studied. The results indicate that surface temperatures and derived vegetation indices (incorporating the thermal and shortwave-infrared bands) were useful for discriminating land cover classes and delineating boundaries between wetlands and water bodies. Accuracy assessment of the classification indicates overall accuracy of 85% was achieved with this technique. The fractional vegetation cover decreased from 1984 to 2000 with a respective increase in surface scaled temperature.

Keywords

surface temperature; vegetation indices; Landsat;

land cover; microclimate; unsupervised classification

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