Feature Based Analysis of the Thermo-Environmental Variability in the North-Western Part of Bangladesh using Multitemporal Landsat TM Data

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Abstract

A feature-based analysis of the thermo-environmental variability in the northwestern part of Bangladesh has been performed using Landsat TM derived thermal information coupled with meteorological data. The study area includes two physiographically different land areas namely flood plain areas of the rivers Ganges and Mahananda and the semiarid Barind Tract area. Surface temperature has been derived from Landsat TM thermal data. The study provides evidences of dynamic variation in surface temperature over time and space. Both surface-feature type and seasonal meteorological variability seem to be the two major driving forces producing the dynamic changes in surface temperature over the area. Spatio-temporal analysis of surface temperature shows relatively homogeneous spatial distribution in rainy season as compared to that in dry season. Seasonal variation has dual effects on the observed variability in the thermal characteristics. Firstly, the amount of incident solar radiation changes periodically with season in a definite pattern in addition to its diurnal variability and thereby, produces certain changes in surface temperature all over the study area. Secondly, seasonal changes in surface cover and its condition associate specific changes in the nature of interaction of energy with the surface due to change in surface thermal properties. Relatively higher variation in surface temperature is observed in the flood plain areas mostly during dry season. Feature-type dependency of surface temperature is very much evident both in flood plain and semiarid Barind areas. The changes in vegetation cover and their possible linkages to the observed variation in surface temperature have been studied. Spectral vegetation index particularly, the ratio vegetation index (RVI) as derived from Landsat TM optical data shows a good correspondence with the observed temperature variability. In this connection, the sensitivity of surface temperature to varying RVI has been analysed. The study reveals that increased RVI caused by increased vegetation decreases the surface temperature over the area. Moreover, such an increase in vegetation amount reduces the sensitivity of surface temperature to varying solar agitaion and thus tends to stabilize the surface temperature. It is also evident that land physiography influencing the hydrological and vegetative processes is a contributing factor in surface temperature determination over the area.