

MAPPING SOIL AND ROCK VARIATION FROM SATELLITE IMAGES IN THE SAHEL

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The use of the Soil Brightness Index (SBI) for mapping soil and rock variation in arid and semi-arid conditions with partial vegetation cover was investigated. The test site was near Kao in the Sahelian pasturelands of the Republic of Niger.

Field visits were undertaken to characterise the range of cover types in the study area and to establish training areas which could be located on Landsat 5 MSS imagery.

The main rock types were laterites in easily identifiable outcrops. Soils consisted of fractured laterite close to the outcrops progressing through various mixtures of clay outwash with laterite gravel to clay outwash furthest from the outcrop. Clay deposits also occur in some depressions and intermittent stream channels. This leads us to suspect the presence of clay underlying most of the sandy soils which cover by far the greatest area and seem to originate from dunes formed in previous periods when the boundary of the Sahara was further south.

Spectral reflectance measurements of surface soils, rocks and vegetation were made in the field using a portable seven-band radiometer.

The relationship between reflectances of the bare soil and rock categories in the red and infrared wavebands was determined by linear regression. These "soil lines" were very similar for both MSS, simulated AVHRR-LAC and radiometer data and had coefficients of correlation 0.9.

The equation of the soil line for the MSS image was used to calculate a transform equation to calculate the value of the SBI for each pixel of the Kao test area. The resulting SBI image was interactively density sliced to produce a thematic map showing soil and rock types.