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## Characterisation of Soil Surfaces in the Arid and Semi-Arid Zone by Means of Remote Sensing

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### Abstract

In the framework of a study carried out on potential dust sources in arid and semi-arid regions in Chad, it was necessary to undertake a regionalisation according to the physical, geo-chemical, and mineralogical characterisation of soil surfaces in the area. Due to the fact that the sampling locations had been selected already on the basis of Landsat TM data, it was at hand to also use these satellite data for the regionalisation.

A first screening showed that some bands of Landsat TM (e.g. Band 3) are frequently in range of saturation. Therefore, it appears not to be reasonable to use Landsat data to correlate spectral reflectance with soil surface properties. Instead, first correlations between soil surface sample properties (texture, electric conductivity, free iron primary and clay minerals) from laboratory and Landsat hyper-spectral and spectral signature (IRIS radiometer) data measurement were established. Recorded IRIS data have been done with respect of natural surface.

This approach necessitates to form groups of correlation for further analysis. Soil surface types like Hamada (gravels), sandy, or lacustrine should be separated in the case that soil properties are identified on the basis of singles bands. However, it is not necessary to build groups for soil properties when bands are combined.

Considering the multiplicity of the influencing parameters, statistical analysis (factor analysis multiple and partial regression) was applied in order to identify the governing factors of the spectral properties.

The results of this approach will be presented here. As a result of this preliminary analysis, it was possible to establish high partial correlation between spectral reflectance of soil surface and specific soil properties. However, some problems appear with certain surfaces like Hamada due to their heterogeneity.

**Keywords:** Remote sensing, semi-arid zone