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Predictive Spectral Lithological Mapping, Geomorphology and Geospatial Correlation of Structural Lineaments in Bornu Basin, Northeast Nigeria

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Abstract : Semi-arid Bornu basin in northeast Nigeria is characterised with flat topography, thick cover sediments and lack of continuous bedrock outcrops discernible for field geology. This paper presents the methodology for the characterisation of neotectonic surface structures and surface lithology in the north-eastern Bornu basin in northeast Nigeria as an alternative approach to field geological mapping using free multispectral Landsat 7 ETM+, SRTM DEM and ASAR Earth Observation datasets. Spectral lithological mapping herein developed utilised spectral discrimination of the surface features identified on Landsat 7 ETM+ images to infer on the lithology using four steps including; computations of band combination images; band ratio images; supervised image classification and inferences of the lithological compositions. Two complementary approaches to lineament mapping are carried out in this study involving manual digitization and automatic lineament extraction to validate the structural lineaments extracted from the Landsat 7 ETM+ image mosaic covering the study. A comparison between the mapped surface lineaments and lineament zones show good geospatial correlation and identified the predominant NE-SW and NW-SE structural trends in the basin. Topographic profiles across different parts of the Bama Beach Ridge palaeoshorelines in the basin appear to show different elevations across the feature. It is determined that most of the drainage systems in the northeastern Bornu basin are structurally controlled with drainage lines terminating against the paleo-lake border and emptying into the Lake Chad mainly arising from the extensive topographic high-stand Bama Beach Ridge palaeoshoreline.

Keywords : Bornu Basin, lineaments, spectral lithology, tectonics
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