

Contribution of Remote Sensing and Geographic Information Systems to the Mapping of the Geological Structures of a Segment of the Pan-African Chain of Dahomeyides in northwest Benin

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The mapping of geological structures is essential in prospecting for mineral and hydrogeological resources by allowing the location of deposits and sites of interest. Thus in the Donga Department, the resolution of the problems related to exploration and mining but also those related to the protection and sustainable management of groundwater resources necessarily involves the lithostructural mapping of this portion of the northwest segment of the Pan-african chain of Dahomeyides in Benin. Remote sensing and GIS remain well undeniable tools in the mapping of geological formations, favorable sites for mineral exploration and indicators of presence of water, which are linear structures (Youan Ta et al., 2014).

This study aims to map the lithological and structural units of the department of Donga, an area located in northwestern Benin where different geological units outcrop.

The realization of this study was possible following the acquisition and use of a material consisting of image data, mapping databases and field data. The use of the techniques of the Analysis with Principal Selective Components (ACPS), the RGB coding, the computation of the indexes allowed the highlighting and the mapping of the large geological formations forming this northwest segment. The spatio-directional Sobel and gradient filtering methods applied to the images led to the development of the detailed linear map. Field trip missions (fieldwork and geophysical surveys) have collected various information relating to the nature and location of outcrops and structural measurements. The synthesis of all these results in a GIS allowed the development of the geological map and fractures of the study area. It has 745 major fractures.

The teleanalytical geological map obtained clearly shows the contours of the various units (gneiss, migmatites, quartzites and granulites) which are sometimes intruded by rare granitic intrusions. The contact zone between migmatitic gneisses and blastomylonites and mylonites with a strong structural tendency has also been highlighted, as well as the northern and southern boundary between migmatitic gneisses and granitoid migmatites. The study of the fracturing intensity reveals the highly fractured nature of the Donga Department, particularly in the North and South.

This remote sensing cartography contributed to the updating of the map of the different geological formations and structural elements. This will facilitate prospecting for mineral and hydrogeological resources in this part of Benin.

Keywords: geological mapping, linear structures, mineral resources, hydrogeological, spatio-directional filtering

Reference

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