



## **Radarsat-1 image processing for regional-scale geological mapping with mining vocation under dense vegetation and equatorial climate environment, Southwestern Cameroon**

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In Cameroon, a great part of the southern portion is marked by a dense forest environment underlain by diversified geological formations which resulted from several successive orogeneses. This tectonic activity favored the concentration of some mineral deposits. The geological formations in this environment outcrop very rarely and discontinuously notably along rivers and apex of mountains. Thus, in situ mapping is tedious and costly. Besides, forest canopy, dust, clouds and fog in this area obscure information on aerial photos and optical satellite images. This study evaluates the potential of Radarsat-1 Synthetic Aperture Radar (SAR) data processing for geological investigation (lithological discriminations and lineament investigations) in this environmental context. This approach used textural analysis based on Grey Level Co-occurrence Matrix (GLCM) on the Radarsat-1 mono-band image, followed by Principal Component Analysis (PCA) performed on eight normalized co-occurrence indices created (mean, variance, homogeneity, contrast, dissimilarity, entropy, second moment and correlation). Three of the indices, the mean, variance and homogeneity, highlighting the morphostructure of the study area and facilitate lithology discrimination were retained. PC1 band was multiplied by itself (as PC1xPC1 image) to enhance the information contained in this neo-canal and to reduce noise during filtering. Directional filters were then applied to the PC1xPC1 image at 0°, 45°, 90° and 135° directions and the structure lines were extracted manually in a GIS software. When applied, individual lithological formations such as continental and coastal deposits, sedimentary stack, micashist, amphibole-garnet gneiss were easily identified and coincided with those already existing on an old geological map from Maurizot et al., 1986. A total of 572 lineaments features (fractures and major faults) were identified on the filtered images and mapped. Major structures (faults) were considered as those clearly identified on the four directions while minor structures (fractures) were those observed on at least two directions. They are oriented in one of the two main directions: NE-SW (N040 to N060) and NNW-SSE (N345 to N360). The lineament result showed those that already existed on the reference map and the newly updated lineaments. Spatial relationships between mapped lineaments and areas of current and historical mining exploration were examined by overall lineament density. Mining sites correlate with areas of high lineament density particularly around the Ngovayang massif within the Paleoproterozoic Nyong unit. This study stresses the usefulness of remote sensing data and methods in field campaign, improvement of old geological maps and mining prospecting in areas with an equatorial climate.

**KEYWORDS:** RADARSAT1 - GLCM - PCA - Directional filters - Geological investigation - Equatorial environment