Regolith Landform Mapping Using Support Vector Machine and Artificial Neural Network: Study Case of Sissingue Gold Project in Côte d'Ivoire

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The use of regolith remains poorly understood and Côte d'Ivoire has no Regolith Landform Map (RLM). Since 1999, at the Sissingué Gold project (SGP), the geochemical campaigns have come up against the problem of understanding the dispersion of the gold anomaly. For this reason, our objective is to develop an RLM of the SGP, located in northern Côte d'Ivoire, to understand the distribution of the anomaly. The approach is based on remote sensing and Geographic Information Systems (GIS). During this research, 13 data sets based on Landsat 8, Aster, Sentinel 1A images, and the ALOS PALSAR DTM were tested using two machine learning algorithms, the Support Vector Machine (SVM) and the Artificial Neural Network (ANN). The best predictions were made using the Landsat 8 image merged with the Sentinel-1A VH image. Geometric and radiometric corrections were made to achieve a level of global accuracy of 87% for ANN and 86% for SVM. However, the field validations are higher for the SVM than for the ANN. Spectral analysis was also used to identify minerals and clay such as goethite, haematite, kaolinite, sulphides and pyrite using the Matched Filtering (MF) and Mixture-Tune Matched Filtering (MTMF) algorithms. These minerals were correlated with the RLM and geological map. The RLM was developed from the SVM best prediction map by overlaying the non-genetic field map and based on interpretation. The regolith scheme used is Relict Erosional and Depositional. The various relict, erosional and depositional units were identified by assigning each subclass to a regolith unit. The geochemical results from soil and drilling were included in the GIS and overlaid with the regolith map for the creation of a geological model to decrypt the gold mineral dispersion. The prospect anomalies are residual but reveal transported units in places, which explains the lack of surface geochemical results.