# Abstract

The oldest parts of continents, so-called cratons, are the focus of worldwide research not only because they represent primary constraints for our understanding of the early evolution of the Earth, but also because of their significant mineral potential. This work contributes to the understanding of the geological and geomorphological evolution of the West African Craton, by an integrated analysis of airborne geophysical and satellite remote sensing data constrained by field structural, lithological, geophysical, and geomorphological observations acquired around Houndé, Boromo and Banfora greenstone belts and associated granitoid domains in western Burkina Faso.

The results of this integration suggest that the granitoid domains of western Burkina Faso are formed by numerous small- to medium-sized plutons, and the magnetic data provided a better definition of the actual pluton shapes. Airborne gamma ray spectrometry data aided in the mapping process in areas with less regolith cover. Three deformation events (D1-D3) can be distinguished in western Burkina Faso. A megacrystic tholeiitic basalt unit allowed us to establish stratigraphic correlations between the two belts and propose a crustal scale anticline (D1). The D1 penetrative structures, resulting from an E-W to WNW-oriented compression are generally overprinted by the D2 transcurrent shear zones, which is well visible in the magnetic data. Previously unreported and already known S2 shear zones represent prospective areas for gold exploration. The regional-scale system geometry was controlled by coaxial shortening of stiffer volcanic units and coeval magma input. The last D3 N-S compression is either late-Eburnean or perhaps even Pan-African.

The mineralogical composition of rocks and derived regolith surfaces may be assessed by visible and infrared spectroscopy. A new spectral library has been acquired consisting of in situ and laboratory 0.35 µm to 2.5 µm spectra of rocks and derived regolith materials. The reflectance spectra of rocks show the influence of typical arid to semi-arid weathering. Fe-OH and Mg-OH absorption features are observable in the mafic and intermediate volcanic rocks as well as in the granodiorites and tonalites. Al-OH absorptions are typical for volcano-sedimentary and sedimentary rocks, and regolith materials. Ferric and ferrous iron absorptions were observed in most of the sampled materials. The spectra of soils partially reflect the mineral composition of the weathered rock surfaces.

Airborne gamma ray spectrometric data, ASTER, Landsat and polarimetric radar data, along with morphometric parameters derived from the SRTM digital elevation model, were used to characterize four different regolith landform units in the Gaoua area. An artificial neural-network classification was applied to the dataset and compared with a maximum likelihood classifier. The best results were obtained with a combination of gamma-ray spectrometric data and derivatives of the digital elevation model. The classification contributed to an increase in the accuracy of the distribution of the classified units and to an actualization of their respective shapes. The approach demonstrates the potential of neural-networks for the combined analysis of airborne geophysical and remote sensing data in regolith landform mapping.