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Regolith landform mapping based on remote sensing data and airborne geophysics in Western Burkina Faso

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The Precambrian granite-greenstone belts of West Africa are currently of great interest both to scientific community as well as the exploration industry. Studying and observing the geology of these ancient terrains is not an easy task mainly due to complex, deep weathering, which effectively masks the underlying bedrock. It is the weathered regolith material and its landforms that can be directly accessed by surface mapping. Knowing the distribution of these regolith landform units and understanding the processes which led to their formation is crucial for any kind of successful geological mapping or geochemical exploration project. In our research we have focused on regolith units in the Houndé and Boromo greenstone belts in Western Burkina Faso.
We examined three approaches to map regolith material and subsequently regolith landform units: subpixel classification, based on spectral characteristics of indicative materials, a polarimetric segmentation of radar data, and a classification of an integrated dataset of remote sensing data and airborne gamma-ray spectrometry data. In situ spectral measurements were used to calibrate ASTER and LANDSAT scenes and served as endmember identifiers. A spectral library has been created containing over three hundred unique spectral measurements. ASTER and Landsat data were classified using the Mixture tuned matched filtering method. Wishart supervised classifier was used on ALOS PALSAR data. Classifications based on supervised maximum likelihood method and neural networks have been applied to an integrated dataset which included SRTM elevation data and airborne gamma-ray spectrometry. Feruginous duricrusts rich in hematite and goethite, clay rich mottled zones relics and fluvial sediments were mapped successfully in the region. The results were compared with existing regolith landform maps and field observations.