

Airborne hyperspectral mapping of the regolith of New Caledonia

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The nickel resources of New Caledonia are estimated at the moment to be one of the largest known on Earth. This resource comes from the specific geological history of that island that is intimately linked with the regolith formation. Two kinds of abundant lateritic nickel ore deposits occur, which are characterised by enhanced formation of 1) limonite (goethite) and 2) silica (garnierite). The ore is concentrated at the transition of saprolite and laterite. Recently, HyMap airborne hyperspectral data were acquired for the first time in New Caledonia (Pacific Ocean) for mineral exploration. Coupled with hyperspectral field measurements, the HyMap data were used to map the weathering profile at the Tiebaghi mine site in the north of the island. From the spectral features of the HyMap data we identified 6 characteristic parameters that define the weathering profile. These consist of: depth and wavelength position of the iron oxide feature at 660nm and 900nm, and the depth of the serpentine features at 2120nm and 2310nm. A classification algorithm, trained on known areas, was applied to map this set of features. We produced two classification maps. The first map classified the weathering profile into 4 classes with an 85% successful classification rate. The second map derivates the weathering profile into 7 classes, resulting in a 74% classification rates. The high classification rates are encouraging for the first attempt of mapping of the regolith of New Caledonia with hyperspectral data.