NEW HYPERSPECTRAL AND ASTER METHODS AND PRODUCTS FOR MINERAL EXPLORATION AND SURFACE MATERIALS MAPPING IN AUSTRALIA

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1. SUMMARY

Extensive tools and benefits can be gained for mineral explorers, land-users and government and university researchers using new spectral data and processing techniques. Improved methods were produced as part of a large multi agency project focusing on the world-class Mt Isa mineral province in Australia. New approaches for ASTER calibration using high-resolution HyMap imagery through to testing for compensation for atmospheric residuals, lichen and other vegetation cover effects have been included in this study. Specialised data processing software capable of calibrating and processing terabytes of multi scene imagery and a new approach to delivery of products, were developed to improve non-specialist user interpretation and comparison with other datasets within a GIS. Developments in processing and detailed reporting of methodology, accuracies and applications can make spectral data a more functional and valuable tool for users of remote sensing data.

A highly-calibrated approach to data processing, using PIMA ground samples to validate the HyMap, and then calibrating the ASTER data with the HyMap, allows products to have more detailed and reliable accuracies and integration with other data, such as geophysical and regolith information in a GIS package, means new assessments and interpretations can be made in mapping and characterising materials at the surface. Previously undiscovered or masked surface expression of underlying materials, such as ore deposits, can also be identified using these methods. Maps and products made for this project, covering some 150 ASTER scenes and over 200 HyMap flight-lines, provide a ready-to-use tool kit that aids explorers in identifying and mapping unconsolidated regolith material and underlying bedrock and alteration mineralogy.

Bedrock signatures have been discovered in the well-studied Mt Isa region, in areas recorded as "extensive cover sediments", where no bedrock had been mapped previously. This means that, in addition to being able to make mineral classifications that characterise transported materials and may indicate buried resources, it is also possible to find new windows of basement geology in areas previously mapped as cover. This has considerable applications for mapping geomorphic processes, understanding and characterising chemical dispersion pathways, and targeting surface sampling for mineral exploration.

A collaborative project between, Geoscience Australia, the Predictive Mineral Discovery Cooperative Research Centre (pmd*CRC) and the Commonwealth Scientific Research Organisation (CSIRO) to developed in conjunction with the Queensland State Government a comprehensive spectral geology study. This work demonstrated that vital geochemical information about hydrothermal deposit "footprints" and alteration chemistry can be acquired by analysing spectral ground response, particularly in the short-wave infra-red, where a great deal of mineralogical information is available. Materials that can be mapped include clays and magnesium/iron/aluminium oxyhydroxides, as well as details on mineral composition, abundance and physicochemistries (including crystallinity) for minerals such as kaolinite, which can be used as a surrogate for identifying transported

vs. in situ regolith material. High resolution mineral maps enable the recognition of various types of hydrothermal alteration patterns and the localisation of fluid pathways, including geochemically discrete alteration shells which correspond to distinct mineral distributions.