Extrapolating regolith geochemical data for regional analysis of the critical layer using ASTER remote sensing data

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The mineralogical composition of the critical layer extracted from VNIR-SWIR reflectance spectra was investigated to establish a link between remote sensing ASTER geoscience products [1] and regolith geochemistry, for the purpose of mapping regolith landforms and mineral footprints potentially related to base metal mineralisation. Advantages of remotely detecting patterns of hydrothermal fluid flow from the cover where the alteration signal is diluted by weathering, and often distorted by transported cover, would be vast. To unravel these connections a regional study (60*110 km) was conducted in the Edmund Basin of the Capricorn Orogen in Western Australia, in an area around Abra basemetal mineralisation.

Analysis of the data suggests the regolith geochemistry reflects the underlying lithology and correlates with the VNIR-SWIR data. The critical layer over basement granites and the overlying Edmund depositional packages 1 and 3 have high SiO_2% in contrast to dolerites and Edmund depositional package 4 where silica content is relatively low. Analysis of reflectance spectra using 2200 nm wavelength depth for Al-clay and 2160 nm wavelength depth for kaolinite feature extraction, combined with 2200 nm wavelength location, suggests that Al-rich clays are kaolinite, which are poorly ordered for most of the dataset, resembling transported material, but that there are occurrences of inferred white micas and other minerals that could relate to insitu regolith and subsequently, the bed rock signature. Compositional differences of Al-clays is also supported by K radiometric images, that indicate K-bearing minerals where reflectance spectroscopic data suggest the presence of white micas. The ASTER AlOH Group composition shows moderate correlation with sample geochemistry Al_2O_3% as well as with reflectance spectra Al-clay composition detected by the change in 2200 nm wavelength position.

[1] Cudahy T., Caccetta M., Hewson R., et al. (2012). Satellite ASTER *Geoscience Map of Australia*. v1. (DOI. 10.4225/08/51400D6F7B335).