# Simulation of airborne hyperspectral imagery for high accuracy mineral mapping in a metal deposit area: a case study of the north Queensland, Australia

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Remote sensing using earth observation satellites has been widely applied as a primary exploration method for resources, because it can extract hydrothermally altered minerals related to the existence of metal deposits and geothermal resources from a wide area. In multispectral images, the number of observation wavelength ranges (bands) from the visible region to short-wavelength infrared region is limited, and the identification accuracy of surface materials is low. In addition, the spatial resolution is not high enough to view the details of the ground surface. On the other hand, hyperspectral images show high accuracy of mineral identification, but observations are limited to a small area just below the orbit and are not suitable for wide-area surveys. Therefore, there is a need for a technology that can generate hyperspectral data even in regions that are not observed by hyperspectral sensors. In order to overcome this problem, a new method, Pseudo-Hyperspectral Image Transformation Algorithm (PHITA) for transforming a multispectral image into a pseudo hyperspectral image has been developed by Hoang and Koike (2017, 2018). It was confirmed that the similarity between the pseudo image generated by PHITA and the original image and the accuracy of mineral identification were high. The spatial resolution of Hyperion, a spaceborne hyperspectral sensor used in the previous researches, is 30 m, whereas the spatial resolution of HyMap, an airborne hyperspectral sensor used in this study, is much higher as 4.5 m. It is also known that the airborne hyperspectral sensor has a higher signal-to-noise ratio than the spaceborne hyperspectral sensor. Therefore, in this study, we aimed to downscale both the wavelength and spatial resolution of multispectral data, and produced pseudo-Hymap images using the HyMap images and multispectral images acquired in northern Queensland, Australia. We verified mineral mapping accuracy and image reproducibility by using statistical indeices.

Keywords: Remote Sensing, HyMap, Hyperspectral Image, Reflectance spectrum, Australia

 