

Hyperspectral mapping of Archaean Epithermal alteration systems at the North Pole Dome, Pilbara Craton, Western Australia

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A Visible and Near Infrared Hyperspectral dataset covering 600 sq. km of the Pilbara Craton, WA, was collected in October 2002. The data are now being examined as part of a collaborative project between the CSIRO and the Australian Centre for Astrobiology. The dataset encompasses a region known as the North Pole Dome (NPD). The NPD is largely constituted by volcanic rocks of the 3.5 Ga Warrawoona Group with some minor, but important interbedded sediments. These sediments have been reported to hold evidence of the Earth's earliest biota [1,2]. It has been suggested by some researchers that the hydrothermal activity evidenced throughout the Dome may have caused early life to flourish at this location [3]. Mapping the extent of this hydrothermal activity is the prime objective of this project.

The HyMap instrument [4] was used to collect the airborne hyperspectral dataset. The Pilbara coverage was collected as 14 swathes, each 2km wide, covering nearly 600 km². The instrument was flown at approximately 2.5km, or 8200ft AMSL. Spectral coverage was between 450-2500 nanometers in 126 contiguous bands. The data were corrected for instrument response and atmospheric effects removed by Hycorr. Various rule based algorithms have been designed to identify mineralogy in the dataset, and these have been verified by work during two field seasons. Maps produced using these techniques will be presented.

Early hyperspectral mapping and fieldwork results of this project will be presented, including evidence for two hydrothermal events, one displaying mineralogy characteristic of low sulfidation, and one high sulphidation epithermal alteration zones [5].

The mapping of hydrothermal alteration zones on Earth using remote sensing has applications for the exploration of the surface of Mars and the continuing search for locations suitable for Mars sample return. The implications of the mapping of hydrothermal alteration minerals at the NPD for NASA's Mars program will be discussed.

Results of the project are available online and continue to be updated at <http://aca.mq.edu.au/abrown.htm>.

[1] Walter, M. R., Buick, R. and Dunlop, J. S. R. (1980) *Nature*, 284, 443-445. [2] Schopf, J. W. and Packer, B. M. (1987) *Science*, 237 (4810), 70-73. [3] Ueno, Y., H. Yoshioka, et al. (2004). *Geochimica et Cosmochimica Acta* **68**(3): 573-589. [4] <http://www.intspec.com> [5] Heald, P., N. K. Foley, et al. (1987). *Economic Geology* **82**(1): 1-26.