Hyperspectral Imaging in South Africa

Hyperspectral Imagaing is one of the services provided by Southern Mapping, South Africa. The high-tech hyperspectral camera used by the company captures over 360 simultaneous images at up to 1 nanometre intervals between 450 nanometres (blue light) and 2500nm, which represents the short wave infra red portion of the spectrum (invisible to the human eye). The company has submitted several joint research proposals to the National Research Foundation, in order to allow local skills development at universities with a strong research focus on hyperspectral technology (including Limpopo, Fort Hare, UKZN and Stellenbosch).

A detailed hyperspectral course to supplement post graduate training at local universities using innovative tele-broadcast via satellite is also planned. In this way the company hopes hope to nurture the local capacity we will no doubt need as the technology continues to penetrate the main stream.

Whereas hyperspectral mapping can directly detect and measure a variety of materials and chemical phenomenon (through their unique spectral properties), others can only be inferred based on correlation. Clay minerals, for example, are directly identifiable through their characteristic absorption of light at exactly 2200µm. But Copper (Cu), Gold (Au) and Silver (Ag) have no recognisable, unique, spectral features within the reflective spectral range of VNIR and SWIR imagers (0.4 - 2.5 nm). Despite this fact, hyperspectral surveys are an increasingly dominant means for guiding exploration for these precious metals. The exploration for these targets is indirect: either secondary minerals are mapped which are known to associate with these metals or the overall spatial distribution of certain target minerals can be used to highlight probable exploration areas. In this same manner, hyperspectral data has successfully been used to address acid mine drainage and leach pad characterisations through associated precipitate markers.

Mineral exploration is the dominant application for hyperspectral imagery. While detailed maps of minerals and associated clay types assist in the identification of ore bodies, the acquisition of the imagery automatically allows for the creation of a baseline environmental audit database as well. So where the data is used to identify where to mine, it doubles up and provides the means to inventory the exact environmental status of the area down to plant species level. In this way, mines are able to comply with mine closure legislation which dictates that the environment needs to be returned to its original state. Hyperspectral imaging is also able to provide extremely accurate direct measurements of chlorophyll a and b concentrations in water and is an efficient tool for quantifying water turbidity.

To give an indication of the technology's current global status, consider the fact that by the first quarter of 2009 over 60 mines spanning 12 European countries had utilised airborne hyperspectral technology. Moreover, hyperspectral imaging has been singled out as the most efficient means for policing the EU's mining waste directive. Apart from Europe, the USA, Canada, Greenland, Australia, Brazil and Chile have actively adopted the technology for mineral exploration and mine related environmental monitoring.

The addition of hyperspectral imaging to the Southern Mapping portfolio of products, which include multispectral satellite imagery and airborne Lidar, allows them to provide end to end solutions to the mining, infrastructure and environmental sectors. By fusing hyperspectral image reflectance values into the intensity signal of their Lidar points, Southern Mapping will be able to continue pushing the limits of technology and provide robust and innovative products.

Southern Mapping also recognises that their investments in the development of hyperspectral imaging solutions in Africa will lay a foundation for the technology's ultimate place in space.