CASE STUDY

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SRGIS Uses Remotely Sensed Data and ENVI® to Target Locations for Mineral Excavation

Mining is big business in Chile. Copper provides 20 percent of Chile's gross domestic product and accounts for 60 percent of the country's exports.[1] Along with copper, Chilean companies also mine for gold, silver, molybdenum, iron, and coal. Mining is labor intensive and expensive, so companies are always in search of more efficient methods for identifying and characterizing potential areas for further exploration.

Remote sensing is being used more frequently by mining companies to acquire information about a geographic area of interest prior to putting any resources on the ground. Advance image analysis tools like ENVI® extract information from remotely sensed data to provide details about the land surface structure, composition, and subsurface of an area. This information can help companies identify areas for mineral exploration prior to investing resources, thereby reducing fieldwork and minimizing environmental impact.

BENEFITS:

- Information extracted from remotely sensed data provides actionable information to target locations where minerals are present.
- Understanding terrain composition helps minimize initial financial and environmental exploration costs.
- ENVI spectral analysis tools provide important data that can help save resources, reduce extensive fieldwork, and ultimately achieve faster results.

ON THE LOOKOUT FOR CLAY

As a result, remote sensing specialists at SRGIS Geología y Geomática Ltd, based in Santiago, Chile, applied their expertise to investigate new and efficient mineral prospecting techniques for their clients. One technique they recently tested was identifying locations with alteration minerals, such as clay, which are typically found near other more sought-after minerals. SRGIS wanted to determine if previously mined locations had high clay content.

To do this, they needed to identify hydrothermal alterations in remotely sensed imagery. Hydrothermal alteration occurs when existing minerals in older rock regions are modified due a change in the environmental conditions. When these existing minerals come into contact with hot water from the earth, they are transported to the surface.

DIGGING INTO THE DATA

SRGIS consultants used the spectral tools in ENVI to analyze ASTER imagery. The ASTER sensor is designed specifically to measure diagnostic absorption bands related to mineral groups like clays, carbonates, silica, and iron oxides. SRGIS obtained ASTER imagery from May 2001 (Figure 1) of the mining areas of Quebrada Blanca, Rosario, and Ujina. The light blue regions in Figure 1 are indicative of hydrothermal alteration.

"We used ENVI to develop a seamless end-to-end solution – opening specific image formats, making the necessary pre-processing corrections, and performing the spectral analysis for the area of interest," said José Manuel Lattus Sanhueza from SRGIS. The analysis was performed to determine if ENVI could reliably identify zones that were high in argillic (clay) content.

The yellow area in the processed ASTER image (Figure 2) identifies areas of high clay content. To further validate their findings, the consultants compared the results from the May 2001 ASTER image with a Landsat 8 image taken in May 2016 (Figure 3). The areas where clay was present 15 years ago correlate to zones where minerals have since been excavated.

Figure 1: ASTER image from May 2001.

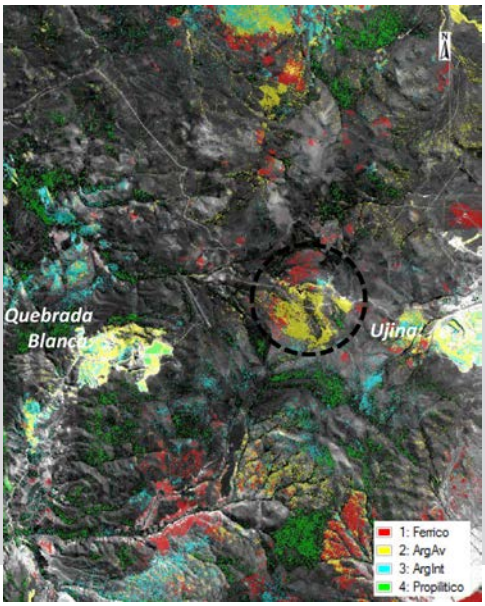

Figure 2: ASTER image processed using ENVI.

Figure 3: Landsat 8 image from May 2016.

To show that ENVI could be used to identify clay minerals in unexplored regions, consultants at SRGIS analyzed an area north of the existing Rosario mine where there is currently no mining activity. They used the ENVI Decision Tree tool to classify the clays of hydrothermal origin according to their spectral characteristics (Figure 3). After completing the spectral classification using the Decision Tree, the result (Figure 4) revealed that it is possible to precisely detect several zones with argillic alterations. These results were validated with the official geological composition archives of the terrain in the area. Using this process, SRGIS consultants have been able to recommend areas for future mining activity.

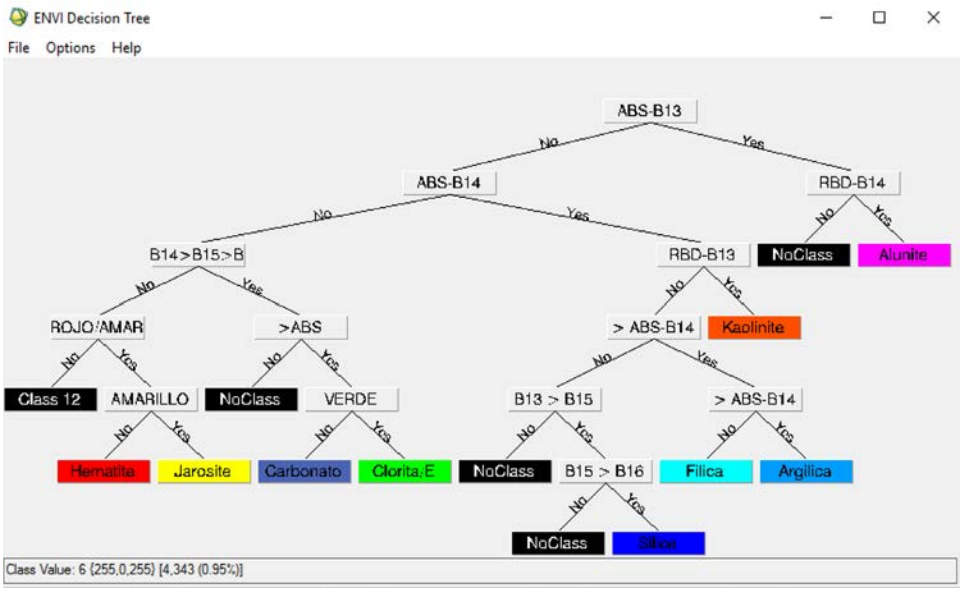

Figure 3: An ENVI Decision Tree is used to identify minerals in clay.

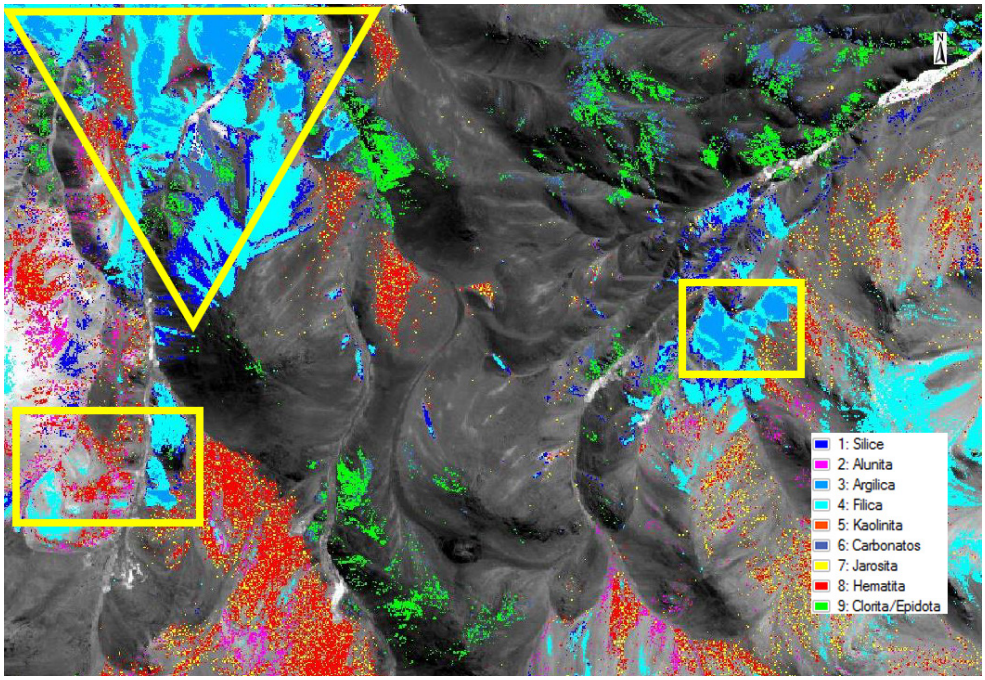

Figure 4: Spectral analysis is performed using ENVI on a WorldView-3 image to show zones with high argillic content (outlined in yellow).

CONCLUSION

Remotely sensed imagery helps support mineral exploration by providing geographical and geological information about an area of interest. The spectral analysis tools in ENVI can be used to identify the presence of an alteration mineral, often an indicator of more sought-after minerals. This information helps mining companies more efficiently target areas for further exploration prior to investing in extensive field work while also minimizing the impact on the environment. The ability to identify scientifically and commercially important minerals and detect alteration zones is important not only for the exploration of minerals, but also in the exploration and development of geothermal fields and production wells.

FOR MORE INFORMATION:

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[1]"Copper solution." The Economist, 27 Apr. 2013.