

Case Study: ENVI extends possibilities for mineral exploration

CUSTOMER CHALLENGE

Dr Sankaran Rajendran teaches in the Department of Earth Sciences at Sultan Qaboos University (SQU) in Oman. His teaching and research specialism is remote sensing and GIS techniques in mineral exploration.

A recent study by Dr Rajendran aimed to show how Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) images can be used to map chromite occurrences in the Semail area of Oman.

Chromite is an oxide mineral composed of chromium, iron and oxygen, dark gray to black in colour with a metallic appearance. Chromite is an ore of chromium, an essential element for a wide variety of metal, chemical and manufactured products. The alloy produced is stainless steel which can alloyed with iron and nickel producing nichrome used to make heating units, ovens and other appliances. Thin coatings of chromium alloys are also used as a plating on auto parts, appliances known as chrome plated. Although other minerals contain chromium none are found in deposits that can be economically mined to produce chromium.

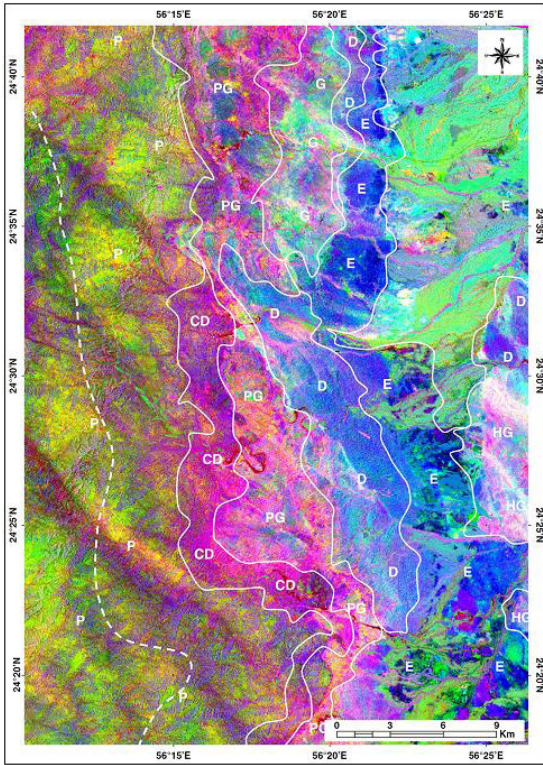
Geologic mapping of this region has historically proved challenging primarily because of inaccessibility but also due to the complexity of the structures and difficulties of lithological differentiation using conventional mapping techniques.

SOLUTION ACHIEVED

ENVI's geospatial image processing tools allowed Dr Rajendran to discriminate and evaluate the occurrences of chromites bearing mineralized zones within ophiolites. He did this by analysing the capabilities of Landsat TM and ASTER satellite data using a number of image processing methods - namely decorrelated stretching, different band rationing and principal component analysis.

"ENVI was the perfect solution to achieve the goals of the study," said Dr Rajendran. "The results show that the processed VNIR and SWIR spectral wavelength regions are promising in detecting the areas of potential chromite, proving to be successful for the mapping of serpentinized harzburgite containing chromites."

"The extensions and options of the tools in ENVI allow me to fully explore my area of expertise, while the results of the study will help exploration geologists, industrialists and mine owners adopt techniques and avoid the limits in field data alone for more exploration and exploitation of areas having chromite deposits in arid regions."



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ASTER image studied using principal component analysis (RGB image of PC7, PC5 and PC4) shows the occurrences of different rock types - (E – Basic extrusives mostly spilites with pillow lava or conglomerate; D – Diabase dyke swarms; G – Gabbro; HG – Gabbroid hypabyssal rocks; PG – Cumulate layered gabbro; P and CD – Sheared serpentinitized harzburgite) in Semail Ophiolite Massifs. Potential chromite mineralized zones are interpreted from image between below the Moho (line separating PG) to run about 1 to 5 km (up to dashed line).

Image courtesy: Dr. Sankaran Rajendran, SQU

KEY BENEFITS

Dr Rajendran has used ENVI since 2002. He highlights the following as the key benefits:

- Pre-processing of different satellite data in different methods
- Analysing and processing of data using different image processing methods
- Providing best results in different scales
- Easy-to-use – SQU students learn ENVI quickly and use with ease in the laboratory.
- ENVI is applications oriented and user-friendly.

Full details can be found in a study published in Ore Geology Reviews, Volume 44 by Dr. Sankaran Rajendran of Earth Sciences department SQU shows how ASTER images can be used to map chromite occurrences in Semail area of Oman. Reference - www.sciencedirect.com



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