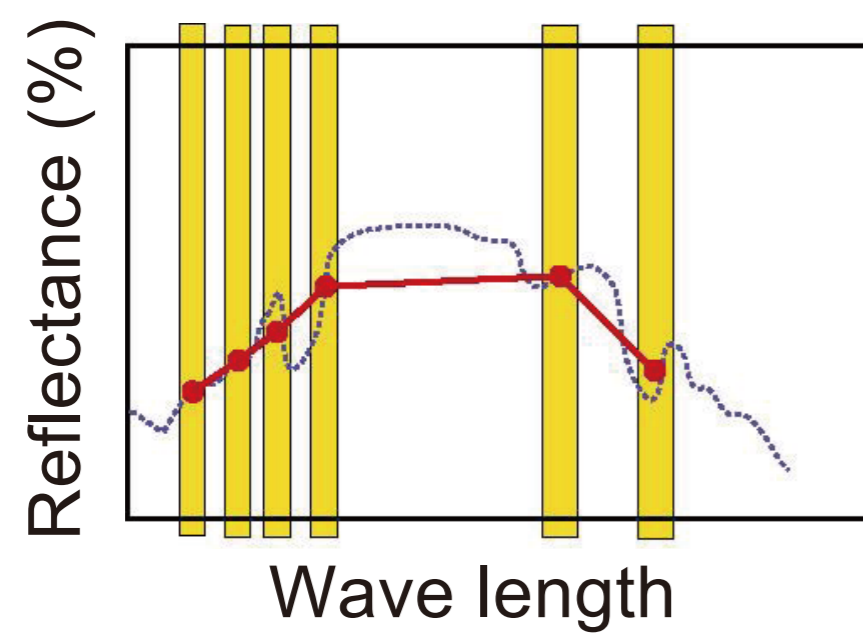


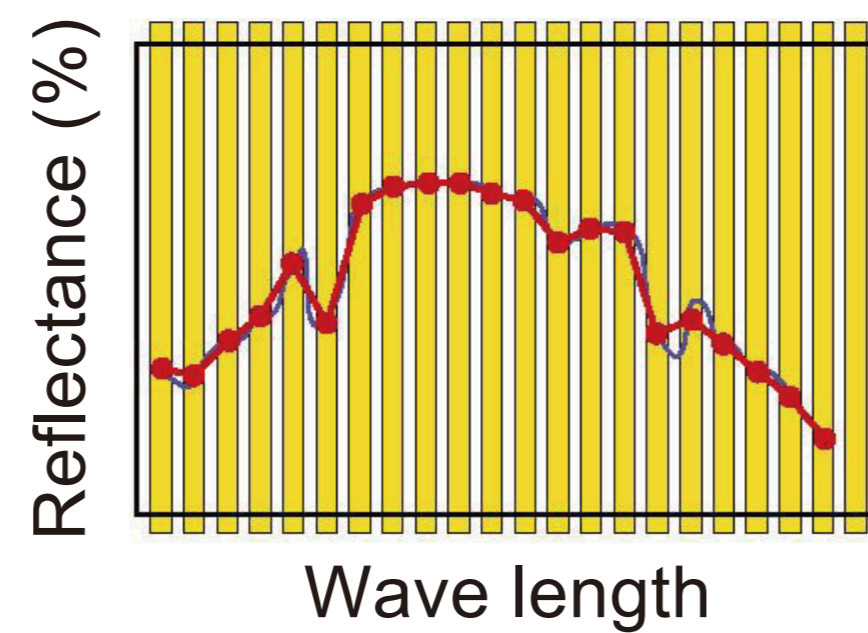
Technology Developments for Remote Sensing Exploration

Introduction

JOGMEC has been developing data processing methods using multispectral and hyperspectral remote sensing sensor data. These sensors are able to identify the alteration types and the alteration zones of intended areas, which are important information for the exploration of hydrothermal ore deposits.



Multispectral sensor data (LANDSAT/TM, JERS-1/OPS, TERRA/ASTER)



Hyperspectral sensor data (EO-1/Hyperion, AVIRIS, HISUI)



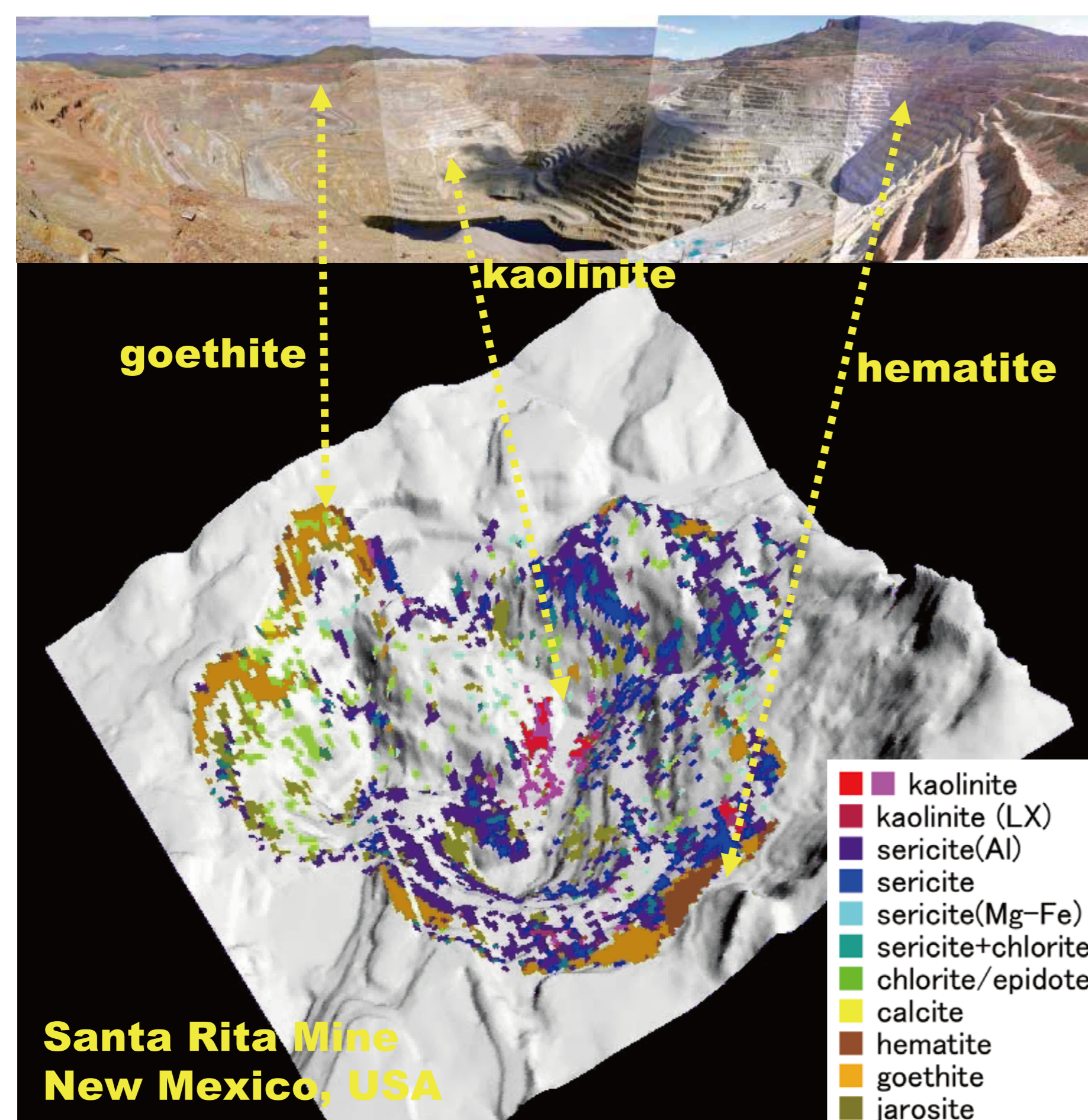
ASTER VNIR false color image (R:G:B=3:2:1). The alteration is not recognizable.



ASTER false color image (R:G:B=4:6:8). Pink patches show the alteration.

Hyperspectral Data Application

Eleven minerals can be identified by processing the hyperspectral data through application of the SAM (Spectral Angle Mapper) classification method. The mineral mapping using hyperspectral data can identify the primary alteration zones related to porphyry copper, epithermal and skarn deposits.

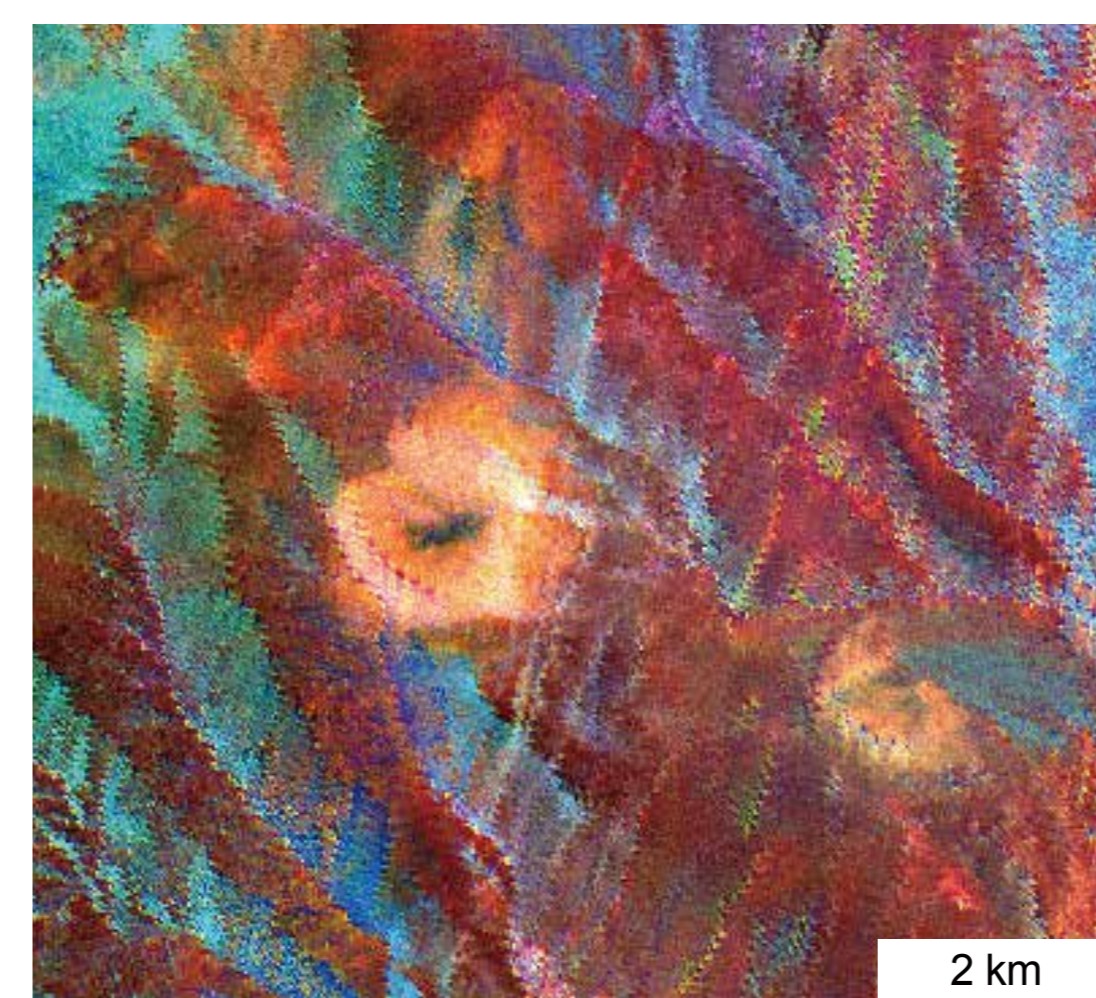


Santa Rita Mine New Mexico, USA

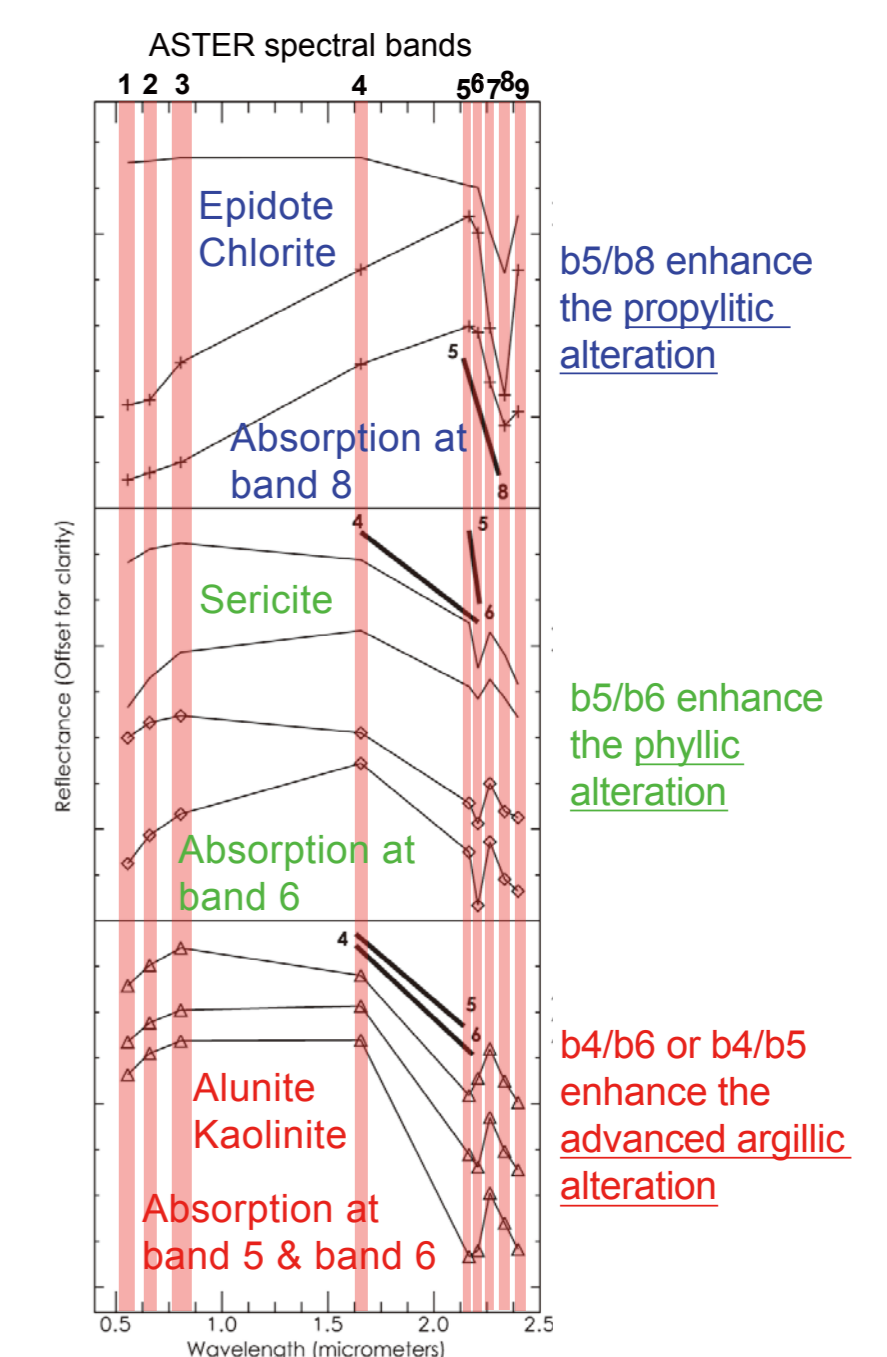
Mineral mapping using Hyperspectral (Hyperion) data.

Multispectral Data Application

ASTER (Advance Spaceborne Thermal Emission and Reflection Radiometer) mounted on TERRA which was launched in 1999 has 14 spectral bands covering the wavelength range of visible and near-infrared (VNIR), shortwave infrared (SWIR) and thermal infrared (TIR). Aster false color image of R:G:B=4:6:8 can clarify the alteration zones while the band ratio image is able to provide information of the alteration types as shown in the pictures below. Those band ratios enhance the advanced argillic alteration, the phyllic alteration and the propylitic alteration respectively. As a result, this ASTER data processing can detect the hydrothermal alteration zone related to porphyry copper or other hydrothermal mineralization clearly.



ASTER band ratio image (R:G:B=4/6:5/6:5/8). Red patches show alunite and kaolinite. Yellow patches show alunite, kaolinite and sericite.

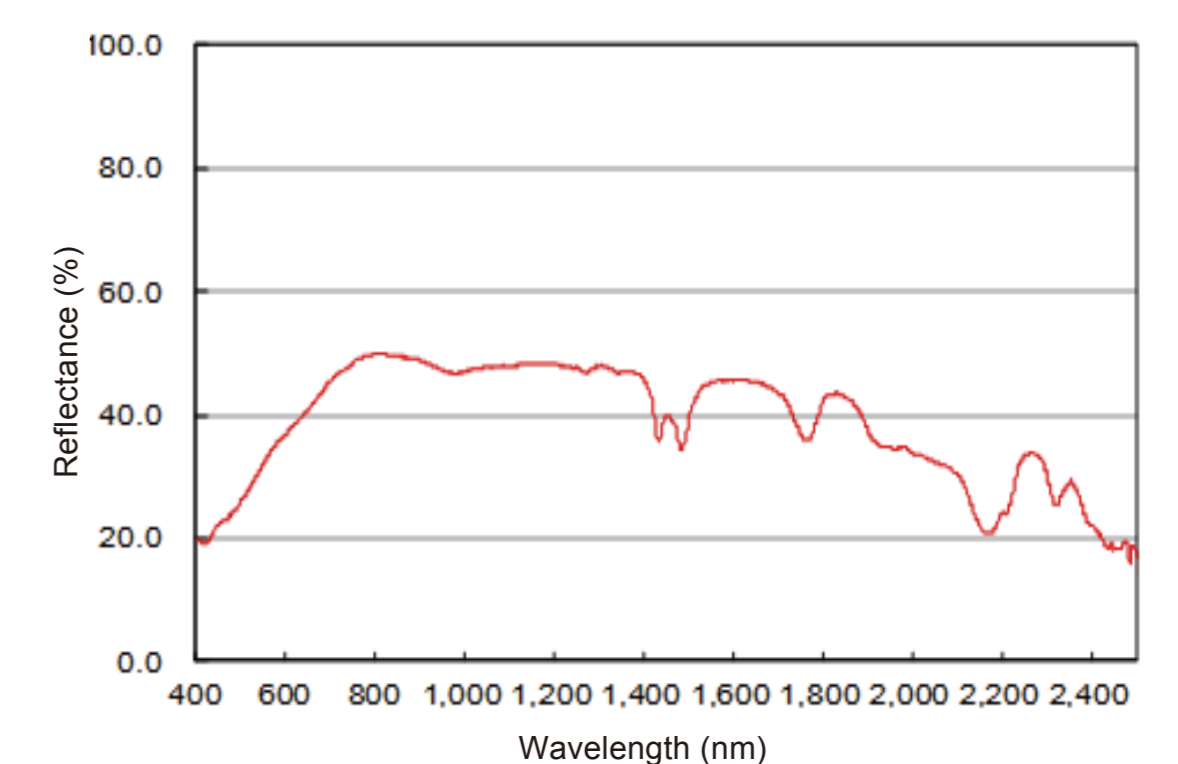


Ground Truthing System

JOGMEC has developed the portable spectrometer and mineral identification program for the ground truthing of remote sensing data processing result. The minerals that have a different chemical composition can be identified from the measured spectra with high spectral resolution.



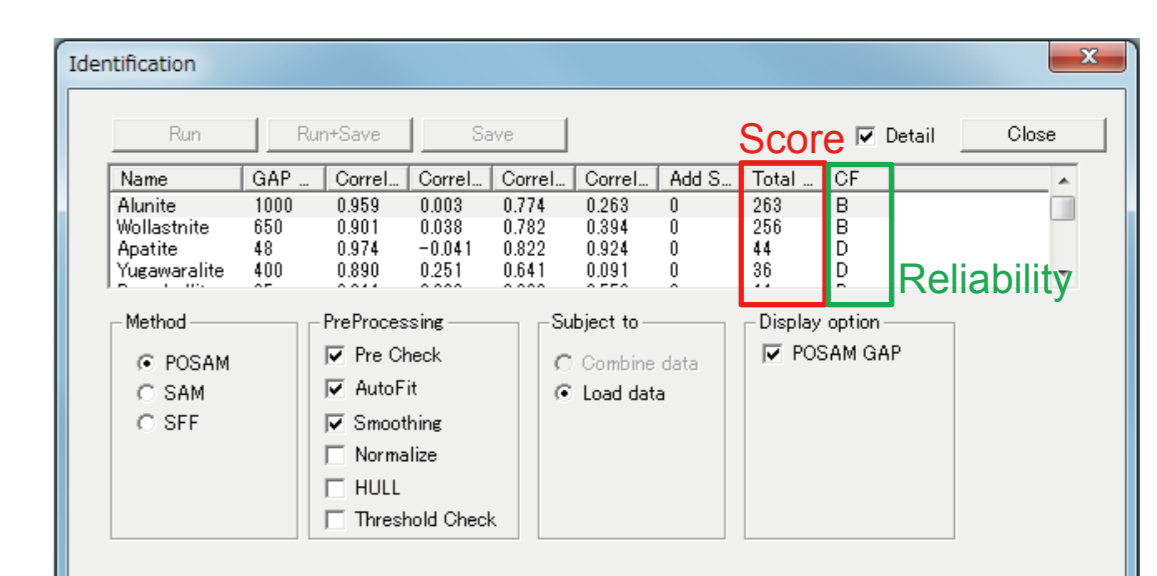
Spectrometer developed by JOGMEC.



Reflectance spectrum measured by the spectrometer.

Specification

Spectral Range	400-2500nm
Spectral Resolution	3nm@400-1000nm 4nm@860-1700nm 10nm@1700-2500nm
Size	16.0*33.0*24.0 cm
Weight	6.0 kg



Mineral identification system by the utility software.

The technical development of "Ground Truthing System" is fully funded by Ministry of Economy, Trade and Industry, Japan.