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THE ROLE OF HIGH-RESOLUTION SATELLITE IMAGES IN DETERMINING THE DEGREE OF MINERALIZATION

Abstract

Remote sensing is mainly used in 2 aspects in geological exploration. 1)in the creation of maps reflecting the geology, fractures and fissures of regions where ore deposits are located and 2)the most important application-the detection and mapping of hydrothermal alteration minerals through their spectral signatures. Recently, multi-hyperspectral imaging systems have become widespread. One of the multispectral commercial satellites, WorldView-3(WV-3) currently has the highest spatial, spectral and radiometric resolution among satellites. Also, this satellite is considered a complete information carrier, including information of potential alterations in the short-wave infrared(SWIR) range. Therefore, the SWIR range of the WV-3 satellite has been widely used in the detection of Al-OH-bearing minerals. A comparative analysis of the spectral absorption properties of rocks with specific wavelengths in the SWIR ranges of Al-OH-bearing mineral sources allows us to determine possible minerals in the study area.

Each pixel on the satellite image has a Digital Number value and these values for bands create a spectral curve of that pixel. Classification methods compare the pixel spectral curve with the reference library spectral curve(USGS) and calculate the statistical analysis and gives the resulting alteration maps for minerals.

Before starting image processing, the first step was to remove the scattering and absorption effects of the atmosphere on the reflectance values of images. For this, effective and commonly used atmospheric correction tools. Different classification methods were tried and according to the quality of the image either absorption-feature-based methodology-Spectral Feature Fitting(SFF), Matched Filtering(MF) or Band Ratios methods applied on the image to get alteration bearing pixels. These areas were mapped as alteration final product.

Additionally, signatures specific to supervised classification were also applied in this research work. Spectral characteristics were measured with an infrared portable spectrometer for mineral analysis by taking samples from the research area. Artificial intelligence cloud systems are used for the interpretation of spectrometer data, which allows easy access to a reliable database of results.

In conclusion we can say that the application of satellite images in geological research has become widespread. Using satellite technologies, it was possible to obtain geologically useful information in inaccessible areas and in geophysical conditions that the human factor could not overcome. In this way, less cost is required for the same area compared to traditional geological surveys, which means significant savings. At the end of the classification process Argillic Alteration, Advance Argillic Alteration, Silica Alteration, Ferric Iron and Ferrous Iron Alteration results were mapped.