Geological-Mining Characterization of the Sierra Rancheria Using Remote Sensing in the Northern Region of Chihuahua, Mexico

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Remote sensing techniques are one of the most important to carry out more selective mining geological exploration, which leads to a significant reduction in associated times and costs. Combining these techniques with fieldwork is essential to ensure the consistency and validity of the results. Sierra Rancheria, located in the municipality of Ahumada in Chihuahua, Mexico, belongs to the Basin and Range province. According to the Mexican Geological Service, the geology of Sierra Rancheria is characterized by an intrusive body of granitic composition (Eocene) that affects units of the Aurora Group (limestone and shale) from the Lower Cretaceous, giving rise to areas of hornfels and skarn. This region is recognized as part of the metallogenic provinces of Ag, Pb, and Zn in Mexico. The study area focuses on the southeastern portion of Sierra Rancheria, adjacent to a non-metallic mineral mining concession, where indications of a skarn-type deposit have been identified. The region has economic importance in metallic and non-metallic minerals, although there is currently a lack of geological-mining information, which prevents the use of these resources. This study employs remote sensing techniques, such as band algebra and band ratio analysis, using ASTER and PlanetScope imagery. These techniques were complemented by fieldwork and petrographic and geochemical analyses, using a portable X-ray fluorescence (XRF) spectrometer. Using this methodology, lithological contacts and zones of hydrothermal alteration were defined. Targets for exploration were delimited to guide future geological exploration and discover potential mineralization areas more accurately.