# Remote sensing and thematic mapping applied to mineral exploration in the Moura-Ficalho base metals mining region, Ossa-Morena Zone, Portugal

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In order to improve mineral and geological understanding of the Moura-Ficalho sector of Ossa Morena Zone, LNEG acquired an image from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) mission. ASTER is aboard of TERRA platform and provides 14 spectral bands in the wavelength range 0.52-0.82, 1.60-2.43 and 8.12-11.650$\mu$m, with a variable spatial resolution between 15 to 90m. These characteristics are particularly interesting in geological and exploration studies adding more information on SWIR and TIR than Landsat 7,8 and Sentinel 2, enhancing the potential for mineral detection and lithological discrimination.

In this work, an ASTER L1T (Precision Terrain Corrected Registered At-Sensor Radiance) image captured on 19-11-2005 was used. Atmospheric correction was applied to the image using Semi-automatic Classification Plugin and QGIS 3.43 software, as well as principal component analysis and band ratios to enhance spectral response of the different geological formations.

The Moura-Ficalho sector is characterized by the presence of Zn and Pb massive and semi-massive sulphide deposits (< 1 Mt), associated with acid volcanic rocks and dolomites belonging to the Dolomitic Fm. (probable Lower Cambrian age). The geological setting includes from base to top a Pre-Cambrian basement; the Dolomitic Fm. and an upper silica horizon, probable related with a Cambrian-Ordovician discordance; the Moura Volcano-Sedimentary Complex (Upper Ordovician?-Devonian? age), represented by bimodal volcanism, marbles, shales and calcoshales and the Moura Phyllonitic Complex "Xistos de Moura" (Silurian) represented by chlorite-sericite phyllites and black cherts (lidites). The geology of the Ficalho sector is conditioned by the southern limit of the OMZ, defined by the Ferreira-Ficalho thrust. Geological structures are NW-SE oriented and large scale folds are present. The geomorphology is clearly conditioned by the differential positive erosion of the Dolomitic Fm. Considering the sulphide mineralization assemblages that occur with magnetite and the host rock geochemistry, several authors consider the Moura-Ficalho ore mineralizations as a SEDEX-Ireland type. The primary sulphides shows significant metamorphic and post-metamorphic reworking and late disseminated and fracture-controlled assemblages are present. The outcropping ore lenses shows intense oxidation and supergene enrichment, exposed in gossans conditioned by the karstic erosion of the Dolomitic Fm.

The mineral potential of this area lead to detailed exploration surveys executed by the former SFM Government Agency (currently LNEG) in the 1980s as well as several mining exploration companies. These surveys generated a large knowledge database containing geologic, soil geochemistry (Cu, Zn, Pb), gravity (Bouguer 2.65) and magnetic (vertical field) data (200*200m grid surveys), which were reprocessed, in this study, to identify and rank several high potential targets. Remote sensing spectral enhanced data shows high correlation with the Dolomitic Fm. which also correspond to the soil geochemical anomalies, in particular in the Ficalho area.
Sectors with geophysical and geochemical anomalies with high mineral potential are: Preguiça, Vila Ruiva, Merlinha, Palhais and Carrasca. The current research can encourage future new exploration works, developed by mining companies, that can lead to execution of new drill holes and new discoveries.