

Geophysical Exploration for Gold Mineralization in Shear Zones: Example From the Iberian Massif (Spain)

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The Iberian Massif constitutes an exceptional study area due to the diversity of its metallic deposits, represented by Au, Ag, Cu, Sn, W, Li, Ta, Sb, Pb, Zn, U and REE elements, which formed towards the end of the Variscan orogenic evolution (350-270Ma). The rich gold reservoir in the orogen became spatially concentrated by shear zones parallel to the belt, possibly reactivated from the geometry of the thrust slices. Shear zones represent the primary pathways for gold-bearing fluids (Groves et al., 2018). We have investigated gold mineralization spatially related to the Villalcampo Shear System (González-Clavijo, 2012), dated at 306±3 Ma (Gutiérrez et al., 2015), at the Roman mining area of Pino del Oro, using geophysical data collected at 142 sampling locations across an area of 28 km². The sampling points were distributed on a 500 m grid within the study area, and measurements were taken at sites where the local slope was less than 5% within a 2 m radius of each point. The datasets include a) gravity measurements using a Scintrex CG6 gravimeter (resolution of 0.1 µGal) in combination with a Leica FLX 100 RTK GPS with a spatial resolution of 3 mm; and b) magnetic measurements using a Geometrics G-856 proton magnetometer, which has a resolution of 0.1 nT. The magnetic susceptibility (k) of the outcropping rocks at each location was checked using a Kappabridge KM-7 portable susceptibility meter. The geophysical results reveal a complex network of dominant NW-SE and NE-SW oriented lineaments, which correspond, respectively, to the main dextral shear zone and sinistral shear zones, which exerting a significant control over mineral deposition. The magnetic data support the occurrence of gold mineralization, and their response also indicates the existence of other possible primary sources that have not been identified in previous studies.