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Vectors to ore in replacive VMS deposits of the northern Iberian Pyrite Belt: the case study of Aguas Teñidas deposit

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Volcanogenic Massive Sulphide (VMS) deposits represent a major source of base, precious and other metals of economic and industrial importance. The Iberian Pyrite Belt (IPB) is an outstanding VMS district located in the SW Iberian Peninsula. It is arguably the largest known accumulation of sulphides on the Earth's crust, and represents the main mining area in Spain and one of the main zones of base metal production in Europe. As in other mining areas, progressive exhaustion of the most shallow and easily accessible deposits is leading to increasingly complex exploration. In this context, the combined study of the mineral systems and the development of new exploration strategies and technologies based on geophysical methods and vectors to ore play a vital role.

Vectors to ore have the potential to detect the nearby presence of an ore deposit, and to provide information on its likely location or characteristics. But work on vectors to ore in IPB is far from systematic or complete. Previous works have focused on the study of the larger exhalative shale-hosted deposits of the southern IPB or the giant Rio Tinto deposit, but little attention has been paid to the predominantly volcanic rock hosted replacive deposits of the northern IPB, which, although generally smaller in size compared to southern deposits, typically present higher base metal concentrations.

In this work we have performed a detailed study of the main vectors to ore currently used in the exploration of VMS systems on a representative volcanic rock hosted replacive VMS deposit located in the northern IPB, the Aguas Teñidas deposit. These have included: mineralized unit identification based on whole rock geochemistry, study of the characteristics and behaviour of whole rock geochemical anomalies around the ore (e.g. alteration-related compositional changes, characteristics and extent of geochemical halos around the deposit), with definition of mineralization-related indicative elements threshold values, application of portable XRF analysis to the detection of the previous vectors, and characterization of major elements trends in mineral chemistry (muscovite, chlorite, carbonate) within and away from the mineralized system.

Data presented in this work are not only applicable to VMS exploration in the IPB, but on a broader scale they will also contribute to improve our general understating of vectors to ore in replacive-type VMS deposits.

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