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Application of the weak leach methods in the detection of massive sulphide mineralisations at great depths – case study of the Lombador deposit, Neves-Corvo mine, Portugal

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The giant Neves-Corvo Cu-Zn massive sulphide deposit representing the largest metal-mining operation in Western Europe and is located in the southeastern end of the Rosário-Neves-Corvo antiform, and is associated with the Volcano-Sedimentary Complex (VSC) of the Iberian Pyrite Belt (IPB). Seven massive and stringer sulphide orebodies have already been identified in the mine area: Neves, Corvo, Graça, Lombador, Zambujal, Semblana and Monte Branco orebodies. The Lombador orebody is zinc-rich concentrating the majority of the known zinc resources at the mine and lies at depths ranging from 600 to 1000 m, striking NW-SE, and its present dimensions are 1350 m long by 600 m wide. The ore lenses dip 20º to 40º northward, reaching a thickness exceeding 100 m.

The geochemical detection of blind mineral deposits at great depth is extremely important in the IPB context. Conventional geochemistry techniques such as classical soil geochemistry are not very efficient because it reflects mostly superficial phenomena. The Mobile Metal Ion technique (MMI) assumes that mobile chemical elements migrate to the surface (by capillarity or electrochemical processes) where they are weakly bound to the soil particles.

For the present work, 50 sampling points were selected above the Lombador deposit or in surrounding areas in a sampling grid of 50 by 50 meters. Samples were collected at a constant depth of approximately 25 cm and sieved in situ at 2 mm and then analyzed analyzed for 61 elements and 4 isotopes. Two statistic treatments were used to interpret the results: The response ratio (RR) and the Centered Log-Ratio transformation (CLR).

The preliminary results suggest that for some elements there is a spatial relationship between surface anomalies and massive sulphide mineralizations at depth (Cu and Zn). The Cu and Zn anomalies using the RR and CLR transformations indicate the presence of N-S oriented anomalies, probably related to deep late faults that intersect the deposit, similar to N-S Lombador fault already known in a mining context. Apparently, for some elements there may have ascended through capillarity phenomena and along deep fractures and/or faults – case of Cu, Zn, Pb and Au. Detailed knowledge of fracturing through geological and structural mapping is essential for the planning of new sampling campaigns.

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