Spatial analysis of geological structures favorability for the occurrence of Sn and W mineral deposits in Bejanca Mine (Viseu – Portugal)

Abstract

The geographic information systems (GIS) are very useful tools for compilation and management of information of different types and sources. These may be used to produce potential or predictivity maps for the definition of areas of high potential for occurrence, but that are not yet known deposits. The integration of different data in the same referential may allow a better understanding of the parameters that control the metallogeny of the region.

In order to better understand the structural influence in Bejanca Tin and Tungsten Ore Deposit, we chose to evaluate the spatial correlation between the known occurrences of tin and tungsten and fracturing. These correlations can be very useful in the future development of a predictability map for tin and tungsten deposits.

Introduction

Bejanca Mine is located in the district of Viseu, more specifically in Querib, Vouzela. This Mine began caisiterite and wolframite exploitation in 1917.

This region consists of greisenized masses including by porphyritic two mica granites, with dominant biotite. Some quartz veins cut the greisen in different directions. This granite contains tourmaline and is traversed by small greisenized veins, oriented NW-SE. Faults are often filled by quartz, caisiterite, wolframite and clay.

The mine area is crossed by a fault system N30° W, there is a fault system oriented N20° E whose box failure is filled with clay, as well as other well-marked direction N5° E and N70° W (Cotelo Neiva, 1944).

The Sn-W mineralizations located in the study area are arranged roughly in the peripheral borders of granitic batholith (Viseu). It is envisaged that the transfer may have occurred from the region adjacent to batholith and was thermally induced by the granitic intrusion. Matter would be obtained from the leaching of the muscovitic-biotitic granites and eventual primary Sn-W mineralization that they contained.

The concentration of tin and tungsten occurrences are bounded laterally by two faults on the west by the Ribama Fault approximate N-S direction and by a fault of this approximate direction NW-SE. These mineralizations are agglomerated in a region of dense fracturing.

Regional fracturation is organized in families arranged mainly according to the following directions: N45°-60° and N300°-310°, corresponding to the most common directions, followed organized by frequency N20°-30°, N335°-355° and N80°-90° (Ferriol et al., 2010).

The highest concentration of mineralization is located on NW of the Geological Map 17 A – Viseu (Fig. 3), in a region composed by the Abraveses granite. It allows us to suspect of a strong structural control, since this tin and tungsten occurrences concentration are laterally bounded by two faults.

Methodology

Delfim de Carvalho (1977) attempted to correlate spatial distribution of endogenic deposits known in Portugal with the main lineaments patterns. He found that a large part of the deposits are located on or near lineaments intersections, suggesting structural control as a factor in their location.

For the geological structures spatial analysis, we used the algebraic method (Knobs-Robinson and Groves, 1997) to quantify the criteria associated with different fault classes.

Our set of data points correspond to deposits as well as linear data correspond to fault fractures, identified in the geological map of Viseu (1:50000) (INEG, Portuguese Geological Survey). A value of 1 is assigned to deposits (points), regardless of their size. Placing a value on the line consists of looking for deposits located inside a band parallel to the line, so all deposits within a certain maximum distance (limax) of a fault was assigned to the line (Fig. 4).

Results

The favorable values for mineral deposits occurrence for each Fault Class are summarized in the graph (Fig. 7) as well as in the table.

Conclusion

The spatial relations analysis between the fault and the known occurrences of tin and tungsten in the region revealed that, despite the most common fractures being N45°-60° and N300°-310°, followed ordered in terms of frequency, N20°-35°, N335°-355° and N80°-90°, the fractures more favorable for Sn and W deposit occurrence are those having N335°-355°, N300°-310° and N80°-90° directions. The results obtained by spatial analyses can result in great importance for future deposits unknown predictability analysis.

References


