

## Abstract

The development in the emerging technologies of information and communications requires more rare metals. The existing resources, insufficient to assume this progress, require further investigations to discover new rare metal deposits. The traditional methods, based on manual overlay, are unsuitable and expensive. Thus, mineral exploration requires updated methods to easily, quickly, and cost effectively delineate new promising exploration zones.

Geographical Information System (GIS) and applied geomatics provide and perfect various modeling techniques implemented in GIS software. In recent years, two spatial modeling techniques were developed and widely applied in mineral exploration, data-driven methods, and knowledge methods. Weight of evidence (WofE) is a data-driven method based on the Bayesian theorem and its fundamental concept of prior and posterior probabilities. The method combines statistically diverse geodata that represent ore-controlling factors by weighting their evidence using "control points" to create a "posterior probability map." Our study area, located at the southern part of Hoggar in the south of Algeria, is potential for Sn, W, and rare metals and encloses several deposits related to peraluminous post-orogenic rare metal granitoids (RMGs). In this work, "weights of evidence" modeling is applied to map mineral potential of this style of mineralization. Seventeen predictor maps, representing the deposit recognition criterion model, were generated from multi-source geodata (lithology, geochemistry, tectonic, magmatism, and geophysics). These data were used as "input data" and the known deposits (48 mineral occurrences) as "training sites." The WofE modeling gets the following results: (1) generate an output map called "mineral potential map" (MPM), where potential zones are reduced to small areas; (2) the MPM efficiently predicts the well-known deposits of Nahda, Sedis, Rechla, and Tit N'Enir; and (3) highlights some unrecognized areas such as Tedjrine, Monts de Tessalit, and Gara Akeboum. (4) The control model demonstrates the possibility to extend the WofE method to the adjacent regions enclosing a small number of known mineral deposits.