



HAL
open science

Coupling Disc-Based Association and Random Forest for Prospectivity Mapping

Alex Vella, Guillaume Bertrand, Bruno Tourlière, Eric Gloaguen, Vincent
Labbé, Charles Gumiaux, Stanislas Sizaret

► **To cite this version:**

Alex Vella, Guillaume Bertrand, Bruno Tourlière, Eric Gloaguen, Vincent Labbé, et al.. Coupling Disc-Based Association and Random Forest for Prospectivity Mapping. 16th Biennial Meeting of the Society for Geology Applied to Mineral Deposits (SGA), Mar 2022, Rotorua, New Zealand. hal-03573090

HAL Id: hal-03573090

<https://brgm.hal.science/hal-03573090>

Submitted on 14 Feb 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Coupling Disc-Based Association and Random Forest for Prospectivity Mapping

Alex Vella, Guillaume Bertrand, Bruno Tourlière, Eric Gloaguen, Vincent Labbé
Bureau de Recherches Géologiques et Minières (BRGM) – Orléans, France

Charles Gumiaux, Stanislas Sizaret
Institut des Sciences de la Terre d'Orléans (ISTO – UMR 7327) – Orléans – France

Abstract. From a general point of view, prospectivity mapping aims at outlining areas with the highest likelihood to host mineralization. In this frame, data-driven approaches rely on statistical and spatial analysis applied on diverse geological features and known mineral occurrences to estimate likelihood, while minimizing the expert inputs in the model. As such, we present here the new “Disc-Based Association” (DBA) method – a prospectivity tool derived from the “Cell-Based Association” (CBA) method (Tourlière et al., 2015) – used to pre-process the data. While most predictive models rely on searching for associations between mineralization and specific geological formations, this method aims at overcoming precision and positioning problems related to geological maps by considering geological environments. The study area is discretized in a regular node grid. Different information layers can be thus integrated (e.g. lithological and structural features, geochemical or geophysical data) and the associations of all these geological factors is defined around each node. Pre-processing of map data thus results in a multivariate matrix covering the study area. Finally, a Random Forest predictive model computes the score from this matrix, allowing it to (i) highlight specific associations around mineral deposits (ii) define one or several metalotects for the considered commodity and then (iii) produce favorability maps. This new methodology is here applied to prospectivity mapping of Sb throughout the West European Variscan Ranges at multiple scales along the Ibero-Armorican Arc. This allows testing and evaluating its consistency for a multi-scale approach. Its efficiency is compared to other methods already used with CBA. We infer that this new multiscale and multidomains data-driven approach coupling DBA and Random Forest will improve this prospectivity mapping method while giving new insights on the genetic processes resulting in Sb deposits through the Variscan Range. This Ph.D research work is funded by the ERA-MIN2 AUREOLE project (ANR-19-MIN2-0002, <https://aureole.brgm.fr>).