Random Forest Classification of Epidote Mineral Chemistry from the Aitik Deposit, Northern Sweden

Michael J. Baker[1], Matthew Cracknell[1], David R. Cooke[1], David Drejing-Carroll[2], Evan Orovan[1]
1. CODES / University of Tasmania, Hobart, TAS, Australia, 2. Boliden, Boliden, Sweden

The ability of propylitic epidote mineral chemistry to record the subtle geochemical signatures of mineralised magmatic-hydrothermal systems has been established by several studies in recent years and is becoming a novel tool for copper and gold exploration in terranes that can supplement traditional geochemical exploration tools (e.g., assay geochemistry, geophysical surveys). Due to their low natural abundance, the tell-tale signatures of trace element anomalism in propylitic epidote from magmatic-hydrothermal systems are often difficult to quantify, let alone define, using simple statistical and graphical interpretation. We have developed a workflow based on results of random forest classification of epidote mineral chemistry analyses from the Aitik Cu-Au-Ag-Mo deposit, northern Sweden, which has potential to help recognise domains of porphyry, IOCG, and metamorphic-dominant mineral assemblages.

The random forest classification model for epidote trace element data can be used as a predictive modelling tool in greenfields and brownfields terranes containing epidote-bearing propylitic alteration assemblages by providing an indication of ore deposit type. This advance can assist mineral explorers by allowing early implementation of predictive ore deposit models when prospecting for ore deposits. Furthermore, the ability of the classifier to identify epidote of metamorphic origin can allow researchers and explorers to effectively screen prospective deformed and metamorphosed samples that are affected by hydrothermal overprints.
This work formed part of the AMIRA P1202 research program, which is part of the Centre for Ore Deposit and Earth Sciences (CODES) at the University of Tasmania.