

How to identify new resource potentials for classical and critical metals in a traditional mining district – Example Erzgebirge (Germany)

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The global economy increasingly consumes high technology metals. Therefore, critical metals like Sn, In, Ge, Ga, and some others get more and more in the focus of exploration and mining. In the Erzgebirge, pneumatolytic and skarn-hosted Sn-W deposits are related to variscan postorogenic granites. Subsequent overprinting and partial remobilization during Pb-Zn and Bi-Co-Ni-Ag-U mineralization phases complicate the metallogeny of In, Ge and Ga.

The WISTAMERZ research project, funded by the German Federal Ministry of Education and Research (BMBF), intends to support exploration for critical minerals in the German Erzgebirge by creating new base data, minerogenic models and predictive maps. New datasets of stream sediment and hard rock geochemistry for more than 45 elements were created for a 4800 sqkm area to gain new insights into the spatial and temporal distribution of potential resources. Such huge geoscientific datasets (detailed geological maps, fault and fracture systems, geophysical and geochemical data, deposit data and others) are hard to compile and analyze. Therefore a new and innovative way for compilation and interpretation by artificial intelligence is currently applied in the frame of the WISTAMERZ project. Artificial neural networks (ANN) are a standard tool for the analysis of complex data sets. However, in the geosciences, they are underutilized due to the complex and interrelated spatial and temporal aspects and the lack of an easy-to-use application software. The advangeo® Prediction Software, developed and maintained since 2007, combines modules to convert geologic maps, geophysical, and geochemical data into ANN-readable input data, the ANN itself, and model assessment and validation tools. Preliminary prognostic maps for Sn were created, with training and validation data drawn from a database of 114 known Sn deposits.

The paper will present methodological insights into mineral predictive mapping (MPM) with ANN and its intended application in the WISTAMERZ project in the German Erzgebirge area.