DeepBEAT: Data Fusion in a District-Scale 3D Model for Mineral Predictive Mapping in the Erzgebirge in Germany and Krušné Hory in the Czech Republic

Andreas Brosig[1], Andreas Knobloch[1]

[1] ***Beak Consultants GmbH, Germany***

Abstract

The Erzgebirge/Vogtland and Krušné Hory is a mineral district in Central Europe measuring approximately 160 by 90 km. The mineralization proceeded in several phases, starting with likely syndepositional Sn and W enrichment in Early Paleozoic passive continental margin sediments. Regional metamorphism of these sediments led to the formation of metamorphic skarns, which were overprinted by subsequent late Variscan granitic intrusions and several episodes of hydrothermal mineralization.

Despite centuries of exploration and mining there is still a potential for concealed deposits related to deep-seated granitic intrusions. Moreover, to the east and south, the mineralized basement units continue for about 30 km below the Cretaceous-Cenozoic cover of the Ohře Rift and the Bohemian Basin up to the Tepla Suture. The mineral potential of this area is entirely untested.

A district scale 3D model extending to 3000 m b.s.l. was constructed from geologic maps, profile sections and drill hole data provided by the Czech Geological Survey (ČGS) and the Geologic Survey of Saxony (LfULG). A cross boundary magnetic and gravimetric data set is being used to refine the model in poorly constrained areas by inversion modelling. The model contains 29 mostly concealed intrusive bodies and 155 Sn/W/Li occurrences and deposits modelled to various degrees of detail. The deposits will serve as training and validation data for the planned 3D Mineral Predictive Mapping (MPM).

A challenge to 3D MPM is the data fusion of many classes of input data that are inherently 1D (information collected along drill holes) or 2D (geological maps, potential field data, surface geochemistry). While much of this is addressed by 3D geologic interpretation and inverse modelling of potential fields, the interpolation of surface geochemical data across the 3D volume has no satisfactory solution. Therefore, we measure geochemical profiles in drill cores that targeted the marginal areas of concealed granite bodies and radial profiles from outcropping granites. Further we collect and map all mineralization indicators and potential geochemical barriers (approximately 11,300 mineralized veins, 4,700 intrusive dykes and 10,400 occurrences of potential “trap” lithologies (calcareous, carbonaceous and metabasitic units).

The goal is to identify and analyze the pattern of geochemical anomalies with respect to these influencing factors and derive an improved interpolation method for geochemical data into 3D volumes and utilize them as input data for 3D MPM.

This work has been conducted in the frame of the “DeepBEAT” research project, which has received funding under Horizon Europe from the European Commission.