SEG 2024 Conference: Sustainable Mineral Exploration and Development

EIS: Exploration Information System – Linking of Mineral Systems and Mineral Prospectivity Mapping

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The Exploration Information System (EIS) project, funded by the European Union (EU) Horizon Europe research and innovation-funding programme, aims to discover new sources of critical primary raw materials within the EU by combining mineral systems modelling and mineral prospectivity analysis methods. As exploration data continues to emerge, the need for efficient data analysis becomes crucial, considering the high cost of data acquisition. Efficient analysis of expensive exploration data has become crucial and recent advancements in artificial intelligence and machine-learning algorithms within geographic information system (GIS) platforms have enabled the integration of geological knowledge and exploration data into complex mathematical models for predicting the existence of new mineral occurrences.

The EIS project promotes a hybrid approach that utilizes mineral systems modelling as the foundation for mineral prospectivity modelling. A crucial component of EIS is a library of geological fingerprints representing diverse types of mineral systems. These fingerprints are used to identify the most relevant mappable geoscientific features essential for successful prospectivity analysis. The project focuses on three mineral systems as case studies: cobalt minerals in volcanogenic massive sulfide (VMS) systems, lithium-tin-tantalum-tungsten minerals in granite/pegmatite-related systems, and rare earths-cobalt minerals in iron oxide copper-gold (IOCG) systems. Selected mineral deposits within the partner countries of the EU serve as study or test sites, and reference sites in South Africa and Brazil, provide additional insights.

The presentation will showcase the newly developed EIS Toolkit, which includes among others preprocessing tools and validation tools, but also new data analysis methods by incorporating artificial intelligence with machine learning and deep learning. In addition, it will be highlighted how geo-models and mineral systems modelling is being integrated into mineral prospectivity mapping. Finally, the first beta release of the open source EIS QGIS Plugin consist of a collection of software tools for semi-automated exploration targeting in QGIS.