

SEG 2023 Conference: Resourcing the Green Transition

Implementation of a Tectonic and Magmatic GIS-Based Database for Porphyry Copper Deposits Across the Southwest USA

Roseanne Marshall¹, Thomas Lamont¹, Frances Cooper^{1, 2}, Robert Loucks³, Adam Gorecki⁴

1. University of Bristol, Bristol, United Kingdom, 2. University College London, London, United Kingdom, 3. University of Western Australia, Perth, WA, Australia, 4. BHP, Melbourne, VIC, Australia

The Laramide belt in the southwestern USA is the world's second largest porphyry province in terms of economic copper. Despite this, there is limited understanding of the regional-scale tectonic and magmatic framework controlling the location, size, and grade of its porphyry copper deposits. Based on the notable presence of two high-grade hypogene deposits along the margin of the Colorado Plateau (Resolution and Bingham Canyon), we seek to understand whether high-grade porphyry copper formation could be linked to prolonged and focused compressional stress along the margins of rigid crustal blocks. To do this requires comparison of the spatial-temporal evolution of the regional stress field with the history of magmatism and mineralisation. We are therefore compiling an open-source geospatial database within a geographical information system (GIS) framework that integrates geochronological, geochemical, structural, magmatic, and mineralisation data across the southwest USA. Existing database query processes routinely used in mineral exploration use a multi-level interface that does not consider geospatial distribution of data. By contrast, our PostgreSQL database system is accessed within QGIS through the PostGIS and DB Manager plugins, allowing the user to easily query tectonic and magmatic data from a simple base map. Using these plugins, and the QGIS processing function "postgreSQL execute and load SQL" (PE&LS), a database query outputs a new layer onto the base map. The QGIS core process is to type the SQL query directly into the PE&LS function or DB manager, but to make it more user-friendly, we will add a dropdown-box-style interface, or similar function. The database also considers the best use of QGIS automated visual functions to allow for relevant data visualisation to occur in one software package, allowing for speedy and convenient report creation. Once completed, the database can be implemented in other areas of exploration where the tectonic-magmatic framework is important.