

Introduction to special section: Mining and minerals exploration interpretation

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Mineral deposits are found in a variety of geologic settings and ore-forming minerals can have a vast range of physical properties. The search for these deposits is also relatively near-surface thus far. These factors allow for a large number of possible airborne and ground-based techniques to be used in geophysical exploration. Deciding on the proper geophysical technique and survey layout requires an understanding of the target, its associated alteration, the variations in physical properties and the geologic and structural setting. Knowing the exploration history is important, particularly in exploration programs that are more mature. Interpretation of the data requires the integration of the myriad of information ranging from physical property models constructed from inversions or forward modeling, physical property data, geochemical data, mineral deposit model, and host geology.

We envisioned a special section on mining geophysics to highlight the integrative nature of mining geophysics through a collection of papers using multiple geophysical data to provide geology and exploration rationale along with the interpretations. So in collaboration with the editor of *Interpretation*, we issued a call for papers that discussed geophysics as applied to mining, discussed all relevant geophysical data and provided geologic information and the exploration rationale along with the interpretations. The following papers provide insight into the importance of geophysics in mineral exploration from the belt or camp scale to exploration focused on a specific orebody.

Wright and Koehler combine controlled-source audio magnetotelluric and gravity data in a previously explored terrain of the Carlin trend. The authors demonstrate that successive geophysical surveys, combined with geologic understanding and target model development were key to a significant gold discovery.

Martinez and Li demonstrate that lithological interpretation techniques based on inversion of airborne

gravity gradiometry and aeromagnetic data can be used to characterize an iron-ore formation in Minas Gerais. The authors show that lithology differentiation using either generic physical property constraints or geologic constraints can contribute to a geologic understanding at the deposit scale.

Olaniyan et al. study the 3D geologic and structural setting of the Sudbury structure using an integration of geologic data with airborne gravity and magnetic data. Using standard 2.5D modeling and 3D Geomodeler software, they generate continuous surfaces in three dimensions for each geologic interface, which leads them to suggest a possible deformation history of the Sudbury structure.

Woolrych et al. present data from a range of airborne and ground-based geophysical techniques that have contributed to the discovery of the Kitumba iron oxide copper gold (IOCG) deposit in central Zambia. The interpretation of geophysical data following an exploration criteria of an IOCG-type deposit model has opened up exploration for this style of deposit in Central Zambia.

Lü et al. present a case study that demonstrates the use of integrating seismic, magnetotelluric, gravity, and magnetic data to interpret the 3D structure and deformation at depth in the Lu-Zong ore district of Eastern China. Insights were obtained into the fault systems and crustal architecture that are essential for understanding the Lu-Zong ore district mineral system and for mineral exploration at depth.

Legault et al. present the results of three different airborne electromagnetic (EM) surveys over the Lalor copper-zinc-gold volcanogenic massive sulfide deposit, which is more than 500 m deep and is in the Flin Flon Greenstone Belt of north-central Manitoba. The active and passive source EM surveys span a five year period, which means that the development of EM systems over this period can be assessed.

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