GEOPHYSICAL DETECTION OF THE HYDROTHERMAL ALTERATION FOOTPRINTS OF ORE DEPOSITS

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Exploring deep or under cover means no expectation of a direct ore deposit signature in exploration data. The deposit, however, is part of a mineralised system with alteration assemblages that may extend kilometres. Where the architecture of such systems is generally understood in terms of alteration domains—the deposit "footprint"—exploration strategy can focus on the identification of such domains and, in the best cases, use their spatial relationships to vector towards the ore deposit.

Potential fields data with extensive coverage are common, and high-quality airborne magnetic data are nearly ubiquitous in modern mineral exploration. The use of geophysical data is appealing because, although it does not directly respond to rock chemistry, it provides the greatest and most uniform areal data coverage. In the age of deep and undercover exploration, direct recognition of footprint-scale hydrothermal alteration from geophysical data is the holy grail of geophysical interpretation.

The key to geophysical recognition of alteration at the ore system scale is the assumption, typically met in practice, that the primary control on physical property variation across the system is formational and structural, with hydrothermal alteration a contributing secondary effect. Specialised interpretation workflows can take advantage of this assumption to create physical property models composed of primary (formational and structural) and secondary (alteration) physical property signatures that are fully consistent with geophysical data and whatever level of geological data is available. The secondary physical property signatures are in many cases directly interpretable in terms of hydrothermal alteration domains.