

SEG 2023 Conference: Resourcing the Green Transition

Recent Advances in Hard-Rock Seismic Technology Applications Unlock the Deep

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Resourcing the future would be easier if we could see underground. We could target higher grades at greater depths and optimise surface operations to minimise our environmental footprint and energy consumption across the life of mine. We could make mining safer. The minerals industry needs new tools to better characterise geology in hard-rock environments for the efficient and cost-effective detection, delineation, and extraction of metals that are important for a sustainable future. The seismic reflection technique offers high-resolution insights into the subsurface at depths down to and beyond economic mining limits, opening new frontiers in in situ locations. We believe the uptake of this technology has been held back in part by the complexity of the data sets, which have required specialist interpreters and software to decipher—until now. Cloud computing and cognitive technologies have enabled customised, data-driven approaches to extract more geologically relatable products from the seismic data that are easier to interpret and easier to use in standard mining workflows. This paper will showcase the latest suite of seismic-derived geological products, focused on key elements of the minerals system, and discuss the associated benefits of how these allow for a deeper and more targeted approach to exploration drilling. Answer products include detailed 3D fault framework models and 3D solid geology models that allow mapping of key rock types and intrusive geobodies several kilometres below the limits of traditional geophysical methods. Further product development beyond exploration is made possible as an increasing volume and variety of geoscience data is integrated within the 3D seismic container, providing critical new insights through different lenses across the life of mine. We believe seismic reflection technology is a vehicle for change in orebody characterisation, helping miners see more underground for a smarter, deeper, and cleaner mine of the future.