SEG 2023 Conference: Resourcing the Green Transition

Battery Metal Exploration: Integrating Satellite, Airborne, Drone and Field Data with Machine Learning Outputs in Cornwall

Mark Broadley
CGG, Crawley, United Kingdom

The geothermal brines associated with granitic rocks in Cornwall have been proven to have globally significant lithium grades. These hot-brines are often localized along faults and fractures and alter the surrounding country rocks.

The clay and iron minerals associated with hydrothermal alteration have characteristic spectral signatures that can be identified by satellites. Multispectral and hyperspectral satellites were used to map the alteration and generate target areas for fieldwork. High-spatial and -spectral resolution airborne hyperspectral data and 3D drone imagery were also integrated to enable more precise target detection. Fieldwork follow-up with a field-spectrometer confirmed the presence of alteration.

Combined with the spectral mapping, satellite elevation data sets and airborne LiDAR were used to generate semi-automated fault mapping workflow. Machine learning algorithms and automated workflows resulted in the rapid processing, interpretation, and delineation of possible faulted areas. The outputs from these were integrated with the mineral alteration mapping to geologically contextualize the target areas.

Using these targets, geologists from Cornish Lithium undertook a ground validation campaign as a key element of the iterative approach that the machine learning model took. This allowed for a highly accurate prospectively map to be generated and the improved delineation of field target areas.