Understanding Your Deposit Better Using Big Data: A Case Study from Kepez North (Kizilcukur), Balikesir, Turkey (Türkiye)

Mikail Mert Gumus[1], Sinem Oguz[1], Ahmet Kerim Sener[2], Ruth Bektas[2], Berkin Ugurlu[1]
1. Galata Mineral Madencilik San. ve Tic. A.Ş., Ankara, Turkey, 2. Ariana Resources plc, London, United Kingdom

There is an imperative towards development of multi-sensor core logging and machine learning algorithms, which generate large multi-variable databases of drilling data, improving the efficiency, accuracy, and detail captured from drill core. This paper summarises an approach to characterise drill core more efficiently and consistently using multi-sensor core scanning within a project-specific workflow to increase the quality of data acquisition and complement core characterisation practices.

Compared to traditional techniques of core logging, digital data collection allows geologists to create repeatable, accurate, and consistent results, providing objective data rather than a set of otherwise subjective interpretations. Such data is obtained either continuously or on a point-by-point basis by a semi-automated multi-sensor analyser directly from the samples in core trays using X-ray fluorescence, magnetic susceptibility, and mineral spectrometry, among other techniques, without sample preparation or significant operator intervention required. Within the context of this study, unsupervised methods such as principal component analysis and K-means clustering algorithms were applied to multi-element results for grouping and defining lithological units, alteration, and mineral composition at Kepez North, where three lithological groups are identified from the lithogeochemistry-derived variables.

Defined lithological units are compared with the results of pXRF geochemical analysis, mineral assemblages from spectrophotometry, and magnetic susceptibility, allowing for multivariate statistical analysis methods. Geochemical studies show gold mineralisation is associated with arsenic and antimony, whilst mineralogy studies show an intensity of smectite and mica group minerals in the host rocks to the mineralisation. Magnetic susceptibility data show high magnetic values and anomalies in ophiolitic rocks. All data is reviewed in 3D, providing further support to the modelling of the deposit. Acquiring multi-variable data, which may not commonly be collected until later in a programme, provides robust understanding of the mineralisation from an early stage, allowing better targeting, thus saving time and money.