

Geochemical Signature of Au-Cu Mineralization in Soil Profiles of the Wadi Al Jaww Prospect and Applications for Exploration, Saudi Arabia

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A geochemical soil survey was carried out over the Wadi Al Jaww prospect located in the western part of the Arabian Shield between the Hijaz and Jeddah terranes. The area is approximately 150 km southwest of Maaden's Mahd Ahd Dahab mine and 150 km northeast of Jeddah city, and 200 km south of Madinah city. No historical work was reported at Wadi Al Jaww. The Maaden discovery was made from exploration geochemistry methodologies including silt, soil and rock samples. The gold and copper mineralization are hosted by the Shiwan complex of tonalite to granodiorite composition belonging to Kamil suite. The soil samples were collected from the A horizons of a soil profile with an 800- x 200-m grid spacing and have been statistically examined using descriptive statistics, bivariate correlations, cluster and principal component analysis to determine elemental associations. The first PC explains 47% of data variation and outlines the association of Au-Cu-Te. Gold is the main indicator of mineralization in soil profiles. Its concentrations reach up to 2.39 ppm, indicating the position of close proximity to mineralization. While gold may be mobile in arid regions where the dissolution of elemental Au occurs by oxic, acidic, chloride-rich waters, the close spatial association of soil anomalies and hypogene gold mineralization indicates limited mobility of gold over the Wadi Al Jaww prospect. Copper is believed to be highly mobile in arid environments and usually incorporated into Fe-, Mn oxides and hydroxides. The composition of soil profiles and the arid environment at project area explains the distribution of metals in soils. The soil geochemistry survey was the main contributor for discovery of project Au-Cu and outlined association of elements could be used as a guide for future discoveries of similar types of mineralization associated with intrusive complexes along suture zones of Arabian Shield.