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Comparison between the effectiveness of regional BLEG and -80# stream sediment geochemistry in detection of precious and base metal mineral deposits in Western Turkey

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Abstract

Stream sediments remain the preferred sampling media for regional mineral exploration programs in most parts of the world where there is a well-defined drainage system. In Au exploration the analysis of either BLEG (bulk leach extractable gold) or acid-extractable Au in the -80# (<180μm) stream sediment fraction are the two most common approaches. Western Turkey contains a variety of mineral deposit types and geological settings. Using a large geochemical database derived mainly from company exploration programs (5,149 BLEG, 11,692 -80# stream sediment analyses and 7,732 rock chip samples), a comparison is made between the efficiency of these two approaches in detecting the known mineral deposits or occurrences. There is only limited variation between the median or 95th percentile values for Au or Cu across the different lithologies, although Cu is higher in BLEG in basaltic areas and Au higher in the ultramafic and metamorphic dominated terranes. Element distributions were examined using both quantile-quantile (Q-Q) and concentration-area (C-A) multifractal plots to establish the major breaks between regional geochemical populations. The C-A fractal plots generated clearer breaks than the Q-Q plots between populations and lower thresholds to the dominant "background" populations (e.g. 2 ppb Au for Q-Q and 0.9 ppb for C-A in BLEG). Overall geochemical patterns in the -80# delivered clearer spatial correlations with known mineral deposits and occurrences than BLEG. Comparing the observed population breaks with the distribution of catchments containing known mineralization, based on the proportion of "true positives" and "false negatives", C-A was more effective at separating populations related to catchments containing Au or Cu mineralization with little difference between BLEG and -80# (~80% agreement) for Au but a superior response in the -80# fraction for Cu. Given ongoing improvements in analytical detection limits for most elements, the use of the -80# (or possibly finer fractions) is recommended over BLEG for regional reconnaissance stream sediment survey in terrains similar to Western Turkey.

Keywords: Geochemical dispersion, concentration-area fractals, anomaly, regional reconnaissance.

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