spectroscopy (ICP–MS) analysis will hopefully chemically confirm the presence of these expected evaporative saturation and ferrolysis layers and their contained metal load.

Partial digestion geochemistry of pediment over the Toki Cluster porphyry copper deposits, Atacama Desert, Chile

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Copper is an important economic metal with many uses in today's society. It is used as electrical wire, in cooking utensils, and in various alloys such as bronze and brass. Due to its economic importance, the ability to locate sources of mineable copper is of great value. Unfortunately, locating copper deposits is difficult as many of the largest ones (porphyry Cu deposits) are buried under thick exotic gravel sequences. A number of techniques are being developed to more easily locate these buried deposits; one of these techniques involves the use of partial digestion geochemistry of soil samples.

The locations of mineral deposits containing elements that are soluble in groundwater can be identified using two different types of mineral layers that are postulated to form in gravels overtop the deposits. One type of layer is hypothesized to have formed via the evaporation of groundwater, and the subsequent enrichment of the remaining groundwater in elements derived from the underlying mineral deposit. This causes saturation of the groundwater with respect to soluble salts of the elements derived from the mineral deposit at depth, and the subsequent precipitation of salts containing those elements. The second layer is hypothesized to form via ferrolysis, a process where ferrous iron dissolved in groundwater encounters atmospheric oxygen diffusing downward from the surface, and oxidizes to form Fe-oxy-hydroxide minerals. These poorly crystalline precipitates then adsorb soluble metals derived from the mineral deposit at depth. Partial digestion geochemical analysis of the fine-grained portions of gravels above mineral deposits can thus detect the transported ions contained in both of these types of layers, and will produce anomalous concentrations in the gravels above mineral deposits.

Field observations over the Toki Cluster porphyry Cu camp in the Atacama region of northern Chile indicate that mineral layers produced via evaporative saturation do exist (pedogenic calcite and gypsum were observed). As a result, other layers composed of salts derived from transported metals from below may also exist. Although Fe-oxide stains were observed in the soils, this is not evidence that ferrolysis has occurred or that Fe-oxy-hydroxide minerals have adsorbed transported ions. However, future partial digestion geochemistry using a de-ionized water leach, along with inductively coupled plasma mass

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