Geochemistry of pediment over the Toki Cluster porphyry copper deposits, Atacama Desert, Chile

LEAH M. CHISTE[1], CLIFF STANLEY[1], AND BRIAN TOWNLEY[2]
1. Department of Earth and Environmental Science, Acadia University, Wolfville, Nova Scotia B4P 2R6, Canada
¶ 2. Departemento de Geologio, Universidad de Chile, Casilla 13518, Correo 21, Santiago, Chile

Most porphyry copper deposits (PCDs) in Chile have been found because they are/were exposed at the surface. The absence of vegetation in Chile has allowed the use of satellite imagery to successfully locate gossans associated with such deposits, and thus most exposed deposits have already been found. The remaining PCDs are mostly covered by pediments and ignimbrites, making them difficult to discover. Over the past 15 years, exploration techniques have been developed to more easily locate these buried deposits; one of these techniques involves the use of partial digestion geochemistry. These partial digestions extract only the metals that are loosely bound to the surfaces of soil particles (metals most likely transported from below by circulating groundwaters), and thus produce anomalies with geochemical contrasts that are higher than those obtained using total digestions.

In this presentation, the results of total digestion geochemical methods applied to fine-grained vertical trench profile samples collected from pediment over and adjacent to the Quetena PCD near Calama, Chile are presented. An aqua regia digestion (with ICP-MS finish) was used because it is virtually to-

Atlantic Geology, 2011, Volume 47, Number 1

tal for the chalcophile pathfinder elements associated with porphyry copper deposits (e.g., Cu, Pb, and Zn). Results illustrate a distinct contamination zone at the surface for many elements, probably due to wind-blown dust from the nearby Chuquicamata PCD and mine. This contamination generally swamps out any anomalies that might exist at depth related to the underlying Quetena PCD. If contaminated samples (those from less than 50 cm depth) are removed from consideration, subtle geochemical anomalies become evident. Partial digestion geochemical methods involving simple deionized water extractions are expected to produce anomalies with much higher geochemical contrast. These results will be reported in future communications.