# Characteristics of sodic-calcic alteration footprints around porphyry Cu deposits: An example from the Highland Valley Copper district, South Central, British Columbia

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Four major porphyry Cu (± Mo) systems, hosted in various intrusive facies of the Late Triassic Guichon Creek batholith, occur in the Highland Valley Copper (HVC) district. Limited exposure and airborne magnetic data indicate that the batholith has an oval shape, elongate to the northwest, with a long-axis of approximately 60 kilometers and a short-axis of 25 kilometers. The batholith is compositionally zoned from older mafic-rich diorites on the margins to younger mafic-poor granodiorites and quartz granodiorites in the center where the Cu deposits occur. We present here the first systematic mapping and characterization of district-scale sodic-calcic alteration and its paragenesis at HVC. Representative vein and alteration halo samples were collected from outcrop at approximately 500 meter spaced centers from the margins of the batholith towards and into the porphyry deposits along multiple (~2 kilometer wide) traverses. Samples were portioned for geochemical analysis and a representative slab cut. Rock slabs from these samples were stained for calcic plagioclase and K-feldspar, and scanned with a hyperspectral scanner (x, y, λ). Integrating feldspar-staining results with hyperspectral images is an effective way to fully describe anhydrous and hydrous alteration mineralogy and elucidate timing relationships. Structurally focused domains of epidote veins with K-feldspar, and locally plagioclase, destructive albite ± epidote alteration halos characterize sodic-calcic alteration. Pervasive albite alteration, locally accompanied by actinolite and relict garnet, occurs close to the porphyry centers. Sodic-calcic alteration appears to have occurred between stages of major Cu mineralization and represents a significant fluid flow event that is expressed up to 7 kilometers away from the Cu centers in north-northeast- and northwest-trending structures. Rocks affected by sodic-calcic alteration were typically overprinted by feldspar-destructive white mica alteration, locally with accessory prehnite, but still show characteristic major and minor element enrichments and depletions: elevated $Na_2O$, CaO and Cl, a decrease in $K_2O$ and FeO, and high Na/Ba and Sr/Ba. Major oxide anomalies and starting elemental ratios, however, are strongly influenced by protolith composition.