

Geology and metallogeny of the Golden Triangle, British Columbia: An overview

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The Golden Triangle includes the largest undeveloped Cu-Au porphyry deposit (KSM), the highest grade recently-opened underground gold mine (Brucejack), and the most precious metal-rich VMS orebody (Eskay Creek) in the world. We present an updated geological model and define five metallogenic epochs responsible for the Golden Triangles vast metal endowment.

Several large calc-alkalic Late Triassic plutons (Stikine suite, ca 222-216 Ma) cut thick accumulations of basaltic volcanic rocks of the Stuhini Group, and are interpreted to mark the approximate Late Triassic arc axis formed as a result of southward subduction (present coordinates). Several porphyry copper systems occur within the belt, and include the 1.8 Bt calc-alkalic Schaft Creek deposit.

During the latest Triassic, profound plate tectonic changes resulted in the changeover from Stuhini Group to Hazelton Group volcanism. The transition coincides with a 150 km-long northerly trend of low-volume silica-undersaturated alkaline plutons of the Galore suite (ca. 211-209 Ma). Associated stocks, magmatic-hydrothermal breccias and volcanic rocks host the 1.2 Bt Galore Creek alkalic Cu-Au porphyry deposit.

Latest Triassic magmatism of the Red Chris suite (ca. 207-204 Ma) formed the Red Chris (1.8 Bt) and GJ high-K calc-alkalic Cu-Au porphyry deposits. The ore is hosted in east-west oriented hornblende diorite to quartz monzonite intrusions that cut the Stuhini Group; they are unconformably overlain by Klastline formation andesitic volcanic rocks (latest Triassic-Early Jurassic) that record the onset of Hazelton Group volcanism.

To the south, the basal Hazelton Group unconformity is overlain by earliest Jurassic quartz-rich sandstones (Jack Formation); they are succeeded by Early Jurassic andesitic and lesser felsic volcanic rocks (Betty Creek Formation). Volcanism is coeval with intrusions of the Texas Creek suite (ca. 198-190 Ma) and numerous high-K calc-alkalic Cu-Au porphyry and epithermal Au deposits, such as KSM, Brucejack, Premier, Snip, and Red Mountain. Volcano-sedimentary successions and ore deposits are strongly controlled by northerly-trending structures.

A fifth metallogenic event is coeval with Middle Jurassic accretion of the Stikine terrane to ancestral North America. Narrow north-trending rift basins in the foreland of the collisional belt hosts tholeiitic pillow basalts, siliciclastic rocks and rhyolites of the Iskut River Formation (upper Hazelton Group); it hosts the past-producing precious metal-rich Eskay and copper-rich Anyox VMS deposits. Outside of the rift, rare calc-alkalic volcanic rocks of the upper Hazelton Group contain the Ag-rich Dolly Varden deposit. Along the northeastern margin of Stikinia, syncollisional arc-like volcanic rocks (Horn Mountain Formation) are prospective for porphyry- and epithermal-style mineralization.