Late Mesozoic and Cenozoic fault systems of the southern Coast Belt; implications for Cu-Au-Ag mineralization in the Harrison Lake region

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The Coast Belt (CB) of southern British Columbia records a complex history of deformation, metamorphism and igneous activity that can be linked in part to progressive shortening and transcurrent displacements along the continental margin of North American since Early Cretaceous time. Shortening began along the eastern flank of the CB with thin-skinned imbrication and SW-directed thrust faulting of volcanic arc and flanking oceanic sequences of the Northwest Cascades System (NCS), and culminated in the L. Cretaceous with thick-skinned imbrication and westward overthrusting of the Cascade Metamorphic Core (CMC). Shear zones associated with fault systems of both the NCS and CMC are characterized by localized domains of high strain and non-cylindrical folding in which mylonitic foliations and associated down-dip stretching lineations are well-developed. Asymmetric fault zone fabrics indicate an upper plate to-the-southwest sense of displacement and support a thrust imbrication model for early assembly of the CB.

The leading edge of the NCS-CMC thrust system is cut by high-angle NW-striking faults of the Harrison Lake Shear Zone (HLSZ), a right lateral transcurrent fault which splays northward into an imbricate fan of high-angle brittle faults. Displacement increases along strike to the southeast across a network of mylonitic shear zones which most likely feed into major dextral transcurrent faults of the northwest Cascades. HLSZ is interpreted to be the leading tip of this transcurrent fault system and appears to have been initiated in Late Cretaceous and/or Early Tertiary time.

Tertiary fault structures which cross-cut HLSZ comprise a system of NE-striking dextral transcurrent faults and conjugate, NW-striking high-angle reverse faults. These structures are part of a regional fault system within the southern CB, and may record crustal shortening associated with eastward subduction of oceanic lithosphere.

HLSZ is recognized to be an important structure in localizing economic gold deposits within SW British Columbia. The gold belt is associated primarily with brittle fault systems along the western margin of the shear zone, and is most likely offset to the north by younger NE-striking transcurrent faults. These NE-striking transcurrent faults may also be important structures in controlling the emplacement of epizonal Late Tertiary plutons and in tapping associated hydrothermal systems. It follows that these transcurrent faults may be providing the necessary structural control for localizing economic concentrations of both base and precious metals within the region. This hypothesis is supported by observed spatial relationships between NE-striking transcurrent faults, post-Miocene plutons and present day hydrothermal systems.

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