Dispersal in areas of variable terrain: examples from west-central British Columbia

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Topography and thick till cover has hindered conventional exploration techniques in much of the alpine and intermontane region of west-central British Columbia. As an area of high mineral potential, the glacial dispersal of till geochemistry and clast lithologies were examined as one part of a GSC-BCGS Nechako-NATMAP Project covering an area of about 11 000 km^2. Samples of till matrix and clasts were collected during regional mapping and from till overlying known mineral deposits at the Bell and Equity Silver mines. Dispersal patterns, or trains, were identified from the concentrations of chemical elements and lithology of the till clasts. The length and shape of these trains from samples collected in areas of known deposits, were then used to model anomalous occurrences identified from regional sampling and to delineate sources of buried mineralization. The project contributed to the discovery of several copper-bearing breccia pipes on the Hearne Hill property at Babine Lake.

Some dispersal patterns do not occur in the classical mode of a linear or fan-shaped down-ice decrease in concentration. Trains in till at the Bell Mine and in soil at the Equity Silver Mine were found to be displaced in directions transverse to the dominant ice flow direction as indicated locally from glacial landforms and striae. At Bell Mine, southeast dispersal of copper, zinc, nickel and mineralized biotite-feldspar porphyry clasts in till are offset to the southwest of the source unit. At Equity Silver Mine, southwestward-decreasing silver concentrations form a dispersal pattern that is displaced to the east-northeast of the source. These displacements were found to be the result of several phases of Late Wisconsinan ice flow events, that could be simplified as: advance, maximum and retreat phases. Advance and retreat ice flow phases were controlled predominantly by topography, while glacier movements, during the maximum flow phase were controlled by: (a) location of snow accumulation centres, (b) elevation of outlet valleys along the Pacific Coast, and (c) ice sheet profile. In some locations ice flowed in opposite or oblique directions during some phases, resulting in: (1) complex dispersal trains overlying uni-directional striae and (2) linear trains overlying striae indicating multiple ice flow directions.

Our study indicates that an understanding of glacial history is imperative for the correct interpretation of glacial dispersal in areas of variable terrain such as the Cordilleran and Appalachian regions of North America.