

Ice Flow History and Surficial Geochemistry, Huckleberry Mine Area A Drift Exploration Case Study

Ministry of Energy and Mines Energy and Minerals Division

Travis Ferbey (University of Victoria) and Victor M. Levson (B.C. Ministry of Energy and Mines)

Objectives

- develop a new ice-flow model for west-central British Columbia for the late Wisconsinan (last glaciation)
- model glacial dispersal of mineralization in till by investigating the three-dimensional geometry of dispersal plumes



Why Huckleberry Mine area?

- a large number of overburden samples were collected by Huckleberry Mines Ltd., from surface to bedrock, using a Becker Hammer drill rig
- the type and distribution of mineralization in bedrock is well understood
- there is an extensive and thick mantle of Quaternary sediments and good access

Implications for Exploration

- results will provide guidance on interpreting till geochemical data, and aid in identifying the bedrock source of anomalous till samples, for companies working in westcentral British Columbia
- results will suggest strategies on design and implementation of drift exploration programs in areas with similar physical and geological characteristics, and glacial histories





Summary of Ice Flow Study

- the region has a complex glacial history with two dominant ice flow directions (40°-91° and 236°-265°)
- evidence for both flow directions is commonly observed on and field data show different flow directions than airphoto landform interpretations
- west to southwest ice flow dominated during the Fraser Glaciation maximum, followed by a weaker, possibly shorter 2001b)

Ice Flow History of the Huckleberry Mine Area



kilometres datum:NAD83 projection: UTMZone9 tourinterval20m elevationismetresabovemeanseale

CE FLOW INDICATORS	
FIELDDATA(136iceflow stations)	
Ell'X	drumlin;cragandtail;rochemoutonnée;flute(direction definite,directionprobable,directionunknown)
	groove
660	striae (directiondefinite, directionprobable, directionunknown)
l U	rattail (directiondefinite, directionprobable)
AIRPHOTOINTERPRETATION(221iceflowindicators)	
R X	drumlin;cragandtail;rochemoutonnée;flute(direction definite,directionunknown)
NTERPRETED ICE FLOW DIRECTION	
	weaker, possiblyshorterlived,iceflowdirectionduring latestagesofFraser Glaciation
$\langle \rangle$	dominanticeflowdirectionduringFraserGlaciation maximum(westerlyiceflowdominantwithicedivide eastofstudyarea)

imum(topographicallycontrolledeasterlyfic inatedprior bthewestflowreversalattheF

opposite sides of single outcrops, especially in valley settings,

• high elevation sites (>1500 m) generally show only westerly flow

lived, east to northeast ice flow event (Ferbey and Levson, 2001a,

• results agree with those discussed by Levson et. al (1998, 1999), and Stumpf et al. (2000), suggesting the presence of an ice dome in central British Columbia during Fraser Glaciation maximum

Field data plotted as non-directional vectors







high traceelementval

Surficial Geochemistry of Huckleberry Mine



- 102 samples analyzed to date: median Cu 226 ppm, min. Cu 29 ppm, max. Cu 8924 ppm (in boreholes: median Cu 179 ppm, min. Cu 28 ppm, max. Cu 1005 ppm)
- only 17 samples <100ppm Cu
- significant variability in Cu values laterally and verticall



Cross section through A-B (see Routine Surface Sample map), illustrating Cu values in ti profiles. Note locations of Becker Hammer boreholes relative to areas of mineralization.

- nineralization
- mineralization

GENERAL MODEL OF GLACIAL DISPERSAL OF MINERALIZATION



Glacial erosion and transport of mineralized bedrock results in a long and narrow dispersal plume displaced distance "a" in the downice direction. The length to width ratio (c/d; left figure) of glacial dispersal plumes often exceeds 5/1 and the total distance of transport "b" can be 10's of kms.



PRELIMINARY MODEL OF GLACIAL DISPERSAL OF MINERALIZATION AT HUCKLEBERRY MINE

Results to Date

• Accurate interpretations of ice flow history in west-central British Columbia, require field investigations as well as airphoto interpretation

 Westward ice flow dominated during the Fraser Glaciation maximum in the region. A later easterly flow occurred when the ice surface lowered to elevations below ~1500 m

- Surface till samples are highly anomalous in the vicinity of ore zones and elevated west of known mineralization suggesting mainly westward glacial dispersal
- **Becker Hammer borehole samples show** substantial vertical variability possibly due to shifts in ice flow direction
- 1351 ppm Cu 1.5 km west of Main Zone, may indicate buried mineralization there

highly anomalous (>90th%tile) copper in till (>1000 ppm) occurs at 11 sites, all but one occurring west or northwest of known

elevated (>70th%tile) copper in till (>330 ppm) occurs in the vicinity of both zones and extends up to 1000 m west of the Main Zone and 500 m east of the East Zone

• isolated copper anomalies in till may reflect local buried



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