Geochemical Exploration Models of BC Porphyry Deposits Fred Blaine^{*,1} and Craig Hart^{*} *Mineral Deposit Research Unit (MDRU), University of British Columbia, ¹ioGlobal Pty Ltd

Introduction

Research in exploration geochemistry, and the controls on the surficial geochemical expressions of ore deposits, in North America has lagged behind that in other areas of the world (i.e. Australia). This is due in part to the success of exploration using traditional geochemical methods and interpretations. However, as targets are getting scarcer and exploration is moving into areas of thicker and more complex cover, more advanced techniques and interpretations are required; including increased consideration of the surficial environment in which the exploration is conducted.

The widely-varied geomorphological, topographic and climatic environments present in BC; all of which can exert significant control on the surficial expression of ore deposits; present a challenge when interpreting geochemical data. Geochemical exploration models representing "typical" geochemical expressions, in different environments and media, by various analytical techniques, can provide much needed information when planning and interpreting geochemical surveys.

It is the purpose of this study to generate empirically-derived geochemical exploration models for porphyry deposits in BC. This will be achieved through compilation and interpretation of a BC-wide, porphyry geochemistry database based on a number of porphyries. These models will be based on classification of the deposits into categories based on porphyry type, cover (depth and type), topographic and climatic conditions.



		Warm (> 50 days f.f.p.)		Cold (<= 50 days f.f.p.)			
		<u>Steep</u>	<u>Moderate</u>	<u>Slight</u>	<u>Steep</u>	<u>Moderate</u>	<u>Slight</u>
Dry (<500mm n.s.p)	<u>Calc-Alkalic</u>	May	Brenda	Getty South	Takla (Redton-Rainbow)	Gnat Pass	
		Hearne Hill	HE D	Jean	Kemess	Eaglehead	
		Morrison	Alwin		Red Chris		
		Indata	Poplar				
		Schaft Creek					
	<u>Alkalic</u>	Mount Polley	Prime	Galaxy	Chuchi Lake		
		Col	Getty	Ajax			
		Mt. Milligan	Mouse Mountain	Woodjam			
	Moly	Carmi Moly	Mineral Hill				
		Stewart			Storie		
		Davidson					
Wet (>500mm n.s.p)	<u>Calc-Alkalic</u>	OK North	Louise Lake	Gambier Island	Taseko (Empress)		
		Hushamu			New Nanik		
					Whiting Creek		
	Alkalic	Kena Gold					
		Kena (Gold Mountain)					
	Moly	Pitman					

Data Compilation and Interpretation

The primary source for the local geochemical data for this study is the BC Geological Survey's (BCGS) Assessment Report Indexing System (ARIS) archives. Data are primarily stored in PDF documents and are of highly variable quality (right). Where data were of high enough quality optical character recognition (OCR) or manual entry was used to capture these data. To date, data for over 70000 samples (summarized at right) have been collected for 39 porphyry deposits listed above and shown on map (left).

Aside from ARIS geochemistry, necessary supplementary data were collected from multiple sources including:

- ARIS reports (local geology, mineralization, geophysics)
- Government geochemical data (BCGS, GSC)
- GeoscienceBC (QUEST reanalysis and individual reports)
- ClimateBC model
- Geobase 1:50000 topographic data
- Geophysics Government, GeoscienceBC and ARIS reports
- BCGS terrain mapping
- BCSIS
- Glacial history

All available data were compiled and integrated into ArcGIS project files to allow interpretation of geochemical signatures based on physiography, geology, mineralization, surficial materials and glacial history. Individual interpretations of geochemical signatures and processes are being compiled into geochemical exploration models to provide schematic representations of typical or expected geochemical signatures based on the controls and classifications listed above.





 125
 .15
 2
 101
 .01
 .01
 .01

 70
 .13
 2
 1.01
 .01
 .01
 .01

 175
 .13
 2
 1.01
 .01
 .16
 6167

 175
 .16
 2
 1.16
 .01
 .01
 .01

 175
 .16
 2
 1.16
 .01
 .05
 .14
 1

 17
 .07
 3
 1.41
 .01
 .03
 1

 15
 .01
 .01
 .05
 .2





 139E
 135N
 17
 1
 3
 15
 -0.2
 102
 2
 -2

 139E
 137N
 30
 5
 -2
 27
 -0.2
 140
 -2
 1

 139E
 139E
 139N
 29
 -6
 -2
 21
 -0.2
 128
 -2
 1

 139E
 139E
 14
 -1
 -2
 10
 -0.2
 128
 -2
 1

 139E
 14N
 14
 -1
 -2
 10
 -0.2
 400
 -2

 139E
 14N
 17
 -1
 -2
 B
 -0.2
 14
 -2

Sample Type	Current Totals	
Soils (B-horizon)	61000	
Soils (other)	6000	
Tills	2000	
Streams	1000	
Vegetation	500	
TOTAL	~70500	





Final Products

The purpose of this study is to provide a guide to the surficial geochemistry of porphyry deposits in BC as well as provide access to the geochemical data for use by the exploration community. All collected geochemical data, ArcGIS project files (also available as PDFs), interpretations and graphical exploration models are being finalized and will be made available through GeoscienceBC in early to mid 2012.

> Comments and suggestions of a scientific nature or on the project in general are welcomed. Please contact: Fred Blaine, Ph.D.

99th - 100th percentile: 193 95th - 99th percentile: 681 - 1933 ppm Thick, complex, multi-provenance cover 90th - 95th percentile: 395 - 680 ppm Till and glaciofluvial material 75th - 90th percentile: 163 - 394 ppm
 Other 25th - 75th percentile: 27 - 162 ppm

• 0 - 25th percentile: 2 - 26 ppm

Areas of known mIneralization Mount Polley (5823580N, 592100E, NAD 83 Z10

Mount Milligan (6109060N, 434476E, NAD 83 Z10) Mount Milligan - Southern Star (6108415N, 434148E, NAD 83 Z10) Shallow, locally-derived cover

Thick, complex, multi-provenance c

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99th - 100th percentile: 554 - 5463 pp

0 - 25th percentile: 7 - 28 ppm

a - 95th percentile: 158 - 240 ppm

- 75th percentile: 29 - 83 ppm