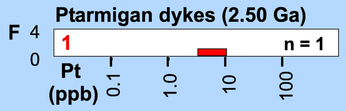
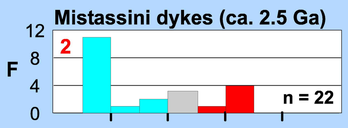
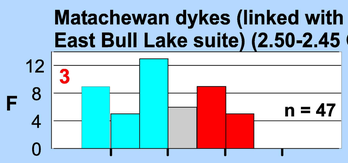
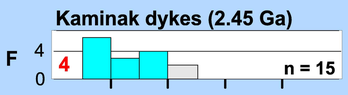
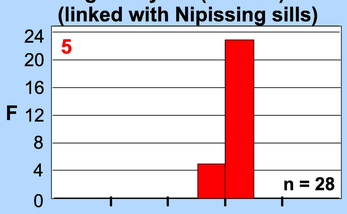
Histograms of log Pt for LIPs and possible LIP components. F = frequency, n = number of analyses. Red number = Event number. Red, grey and blue bars indicate high, intermediate and low Pt values, respectively.
Pt values below detection limit of 0.1 ppm are assigned value of half the detection limit, i.e. 0.05 ppm.

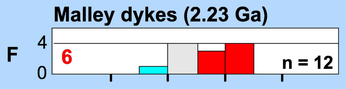


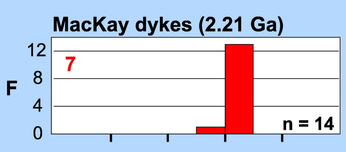


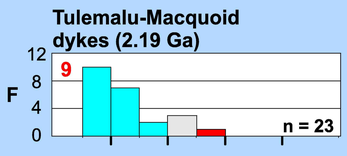


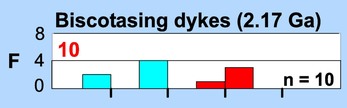


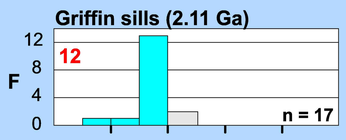


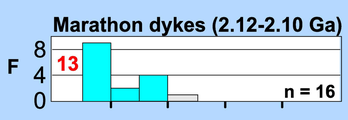


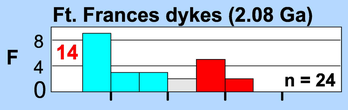


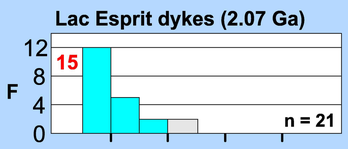


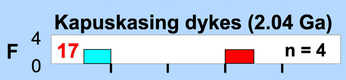


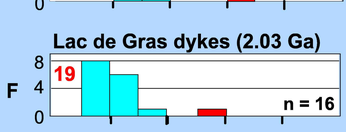


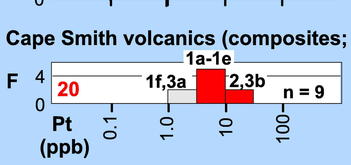




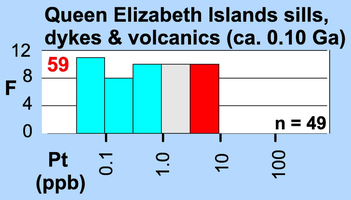


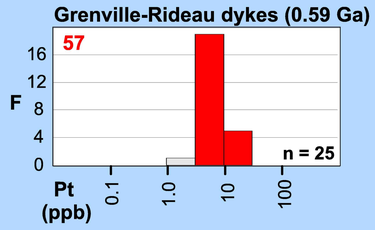


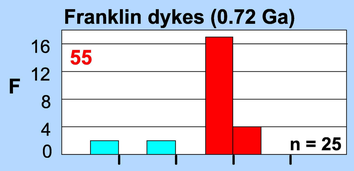


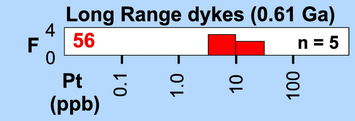


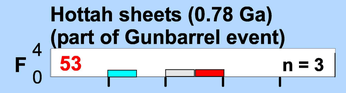
Composites prepared by W.R.A. Baragar from sample traverses (see Fig. 3 and Table III in Moore 1977, in Geol. Assoc. Can. Spec. Paper 16). Traverses: 1a = lower Povungnituk; 1b = upper Povungnituk; 1c = lower Chukotat; 1d = middle Chukotat; 1e = upper Chukotat; 1f =Parant Group; 2 = Chukotat Group; 3a = Povungnituk; 3b = Chukotat

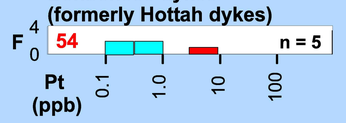


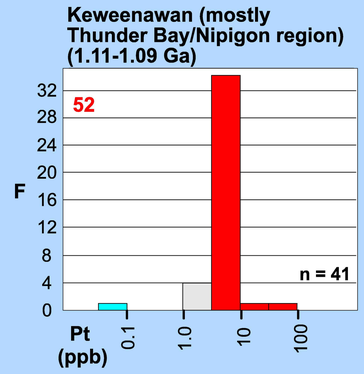


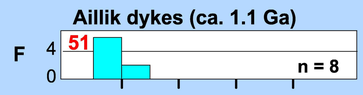


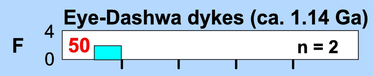


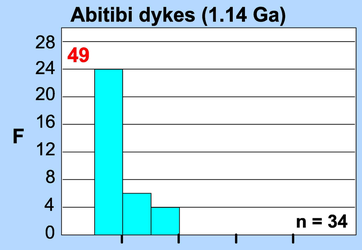


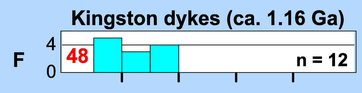


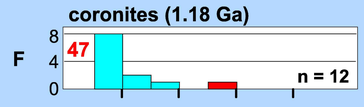


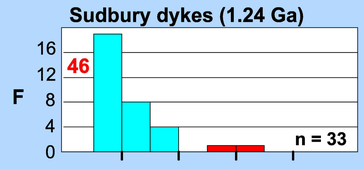


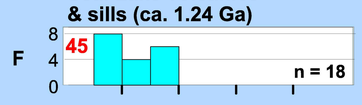


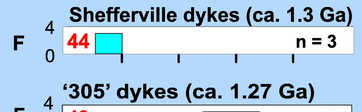


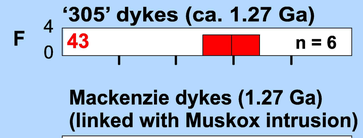


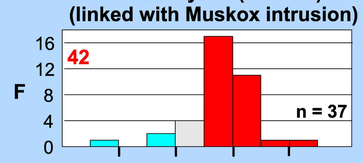


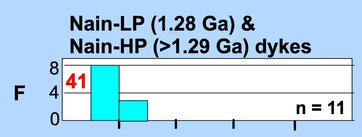


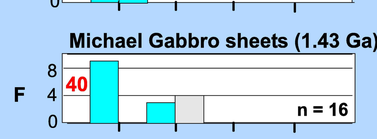












Background Pt-Pd levels in mafic Large Igneous Provinces (LIPs) in Canada

Richard E. Ernst & Larry J. Hulbert, Geological Survey of Canada, Natural Resources Canada,
601 Booth Street, Ottawa, Ontario, K1A 0E8; rernst@NRCan.gc.ca, lhulbert@NRCan.gc.ca

Background concepts

- Large igneous provinces (LIPs) are large (up to several million km in areal extent), short duration (typically <10 Myr), mainly basaltic events. In the Phanerozoic they are dominated by flood basalts. In the Proterozoic their feeder systems of dykes, sills and layered intrusions are typically exposed by erosion. In the Archean they can be linked to komatiite-bearing greenstone belts.
- Since 2.5 Ga they have been occurring globally at a rate of about 1 LIP per 20-30 Myr.
- Nearly all major PGE occurrences in Canada are associated with LIP events, e.g. Muskox Intrusion (1270 Ma Mackenzie LIP), Nikolai occurrences (230 Ma Wrangellia LIP), Fox River sill (1880 Molson-Thompson LIP), East Bull Lake Intrusive suite (2490-2450 Ma Matachewan LIP).
- PGE deposits may be preferentially located within a few hundred km of the plume centre (e.g. in Mackenzie and Matachewan cases)--- because of greater magma flow-through near the plume centre.
- Background PGE levels are a guide to metallogenic potential. High-PGE magmatic events (>5 ppb Pt and Pd), have a greater potential for local concentration via sulphide segregation. (In our dataset, sulphur has a median concentration of 834 ppm, with a range of 70 - 7449 ppm)
- Particularly interesting are dyke swarms having both high and low PGE dykes. Backtracking along the depleted (low PGE) dykes toward the plume centre is a potential strategy for locating ore deposits.
- Potential field surveys (aeromagnetic and gravity) in plume centre regions can be used to identify layered intrusions that may host PGE ores.

Locating new PGE exploration targets in Canada based on a mantle plume model

- Assess PGE potential based on background PGE levels in parental magma.
- Locate plume centres because sulphide extraction most likely occurred in these regions.
- Use aeromagnetic and gravity surveys to identify potentially metalliferous layered intrusions in the plume centre region.
- Within a swarm, identify a specific dyke or group of dykes having depleted PGEs and backtrack along these toward the plume centre in order to identify layered intrusion that may have been correspondingly enriched in PGEs.

References for additional information on LIP events:

- Ernst, R.E., Buchan, K.L. (2001). Large mafic magmatic events through time and links to mantle plume heads. *In:* Ernst, R.E. and Buchan, K.L. (eds.) Mantle Plumes: Their Identification Through Time. Geol. Soc. Am. Special Paper 352, p. 483-575.
- Ernst, R.E., Hulbert, L. (2002). There are PGE-rich and PGE-poor magmas: Evidence from more than 30 mafic magmatic events in Canada (abstract) , GAC/MAC annual meeting.
- Buchan, K.L., Ernst, R.E. (2003). Diabase dyke swarms and related units in Canada and adjacent regions. GSC map 2022A, scale 1:5 000 000.
- Ernst, R.E. Buchan, K.L. (2003). Mafic volcanic rocks and intrusions in Canada from a LIP (large igneous province) perspective. Geoscience Canada (invited paper, in preparation).

Samples provided by:

Larry Aspler	Jean Goutier	Tony Peterson
Bob Baragar	Henry Halls	Bill Phinney
Ken Buchan	Mike Hamilton	Hamish Sandeman
Tim Corkery	John Hanes	Mark Smyk
Tony Davidson	Brett Harris	Subhas Tella
Ron Emslie	Bruce Kjarsgaard	Marie-Claude Williamson
Walter Fahrig	Tony LeCheminant	
Sunil Gandhi	Don Morrison	

Analyses:

- Pt and Pd - Acme Laboratories
- Major and trace element geochemistry- GSC Analytical Chemistry Laboratory

(Interpretation of full geochemistry and integration with PGE data is in progress)

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- Poster prepared with the assistance of John Morgan & Mary Clarke
- Doreen Ames provided an internal review

High-PGE Events

- Grenville-Rideau (G) dykes 590 Ma
- Franklin (F) dykes 723 Ma
- Mackenzie (main stream) (M) 1270 Ma
- '305' dykes ca. 1270 Ma
- Ungava (Senneterre, Maguire, Klotz (K)) dykes 2215 Ma

Low-PGE Events

- Abitibi dykes 1140 Ma
- Kingston dykes ca. 1160 Ma
- Sudbury dykes 1235 Ma
- Indin dykes ca. 2000 Ma
- Lac Esprit 2069 Ma
- Kaminak 2450 Ma

Mixed (High & Low) PGE Events

Matachewan dykes 2445 & 2475 Ma

Mackenzie dykes 1270 Ma

Samples below detection limit (d.l.) are plotted at value of half the detection limit (highlighted in yellow). Some symbols mark multiple samples.

Repeat Measurements on Standard

Plume-Head Centres

middle Chukotat volcanics (>1.87 Ga)
21
n = 10

upper Chukotat volcanics (1.87 Ga)
22
n = 11

Indin dykes (ca. 2.0 Ga)
23
n = 13
Pt (ppb)

Tree River dykes
24
n = 5

Minto dykes (2.00 Ga)
25
n = 8

Eskimo volcanics (ca. 2.0 Ga)
26
n = 8
Pt (ppb)

Sleeper Island sills (ca. 2.0 Ga)
27
n = 5

Flaherty volcanics (ca. 1.9 Ga)
28
n = 14

Mugford volcanics (1.95 Ga)
29
n = 9
Pt (ppb)

Wabigoon dykes (ca. 1.9 Ga)
30
n = 4

Molson dykes (mostly 1.88 Ga) (coeval with Fox River sill)
31
n = 9
Pt (ppb)

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2003

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