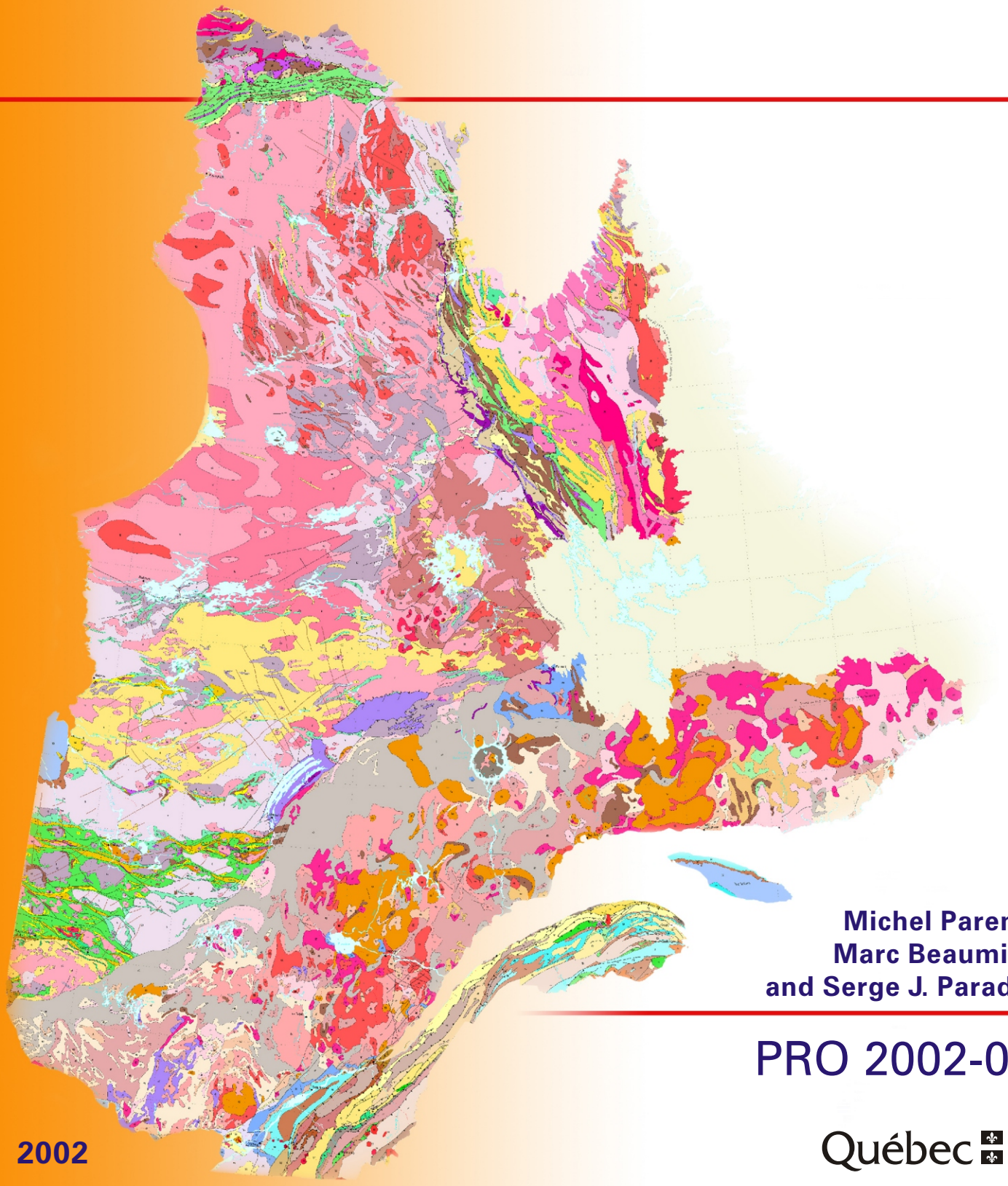
A new high-potential target for diamond exploration in northern Québec

Chromium picroilmenites in esker sediments of the Lac Bienville (33P) region



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PRO 2002-03 : A new high-potential target for diamond exploration in northern Québec - Chromium picroilmenites in esker sediments of the Lac Bienville (33 P) region

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In the course of a joint GSC-MRN project supported by the Targeted Geoscience Initiative, two chromium picroilmenite grains were identified. These grains were obtained during a reconnaissance survey of esker sediments in the Lac Bienville (33 P) map area in northern Québec (Figure 1). Since chromium picroilmenite is one of the most characteristic minerals of kimberlites and since glacial and glaciofluvial sediments in northern Québec are characterized by very short dispersal trains of kimberlite indicator minerals as well as a very low background counts (R. Girard, personnal communication, Feb. 19, 2002), this finding is considered as significant for diamond exploration in the region. This regional esker survey sampling was conducted in 2001 as a first step in our ongoing assessment of the diamond potential of the Saindon-Cambrien and Richmond Gulf corridors (Moorhead ***et al.***, 2000).

The Lac Bienville survey consisted of 33 esker sediment samples which were collected from cobbly or pebbly lithofacies, thus taking advantage of hydraulic sorting effects. Samples were dry-sieved in the field to obtain approximately 20 kg of minus 5.6 mm sediment. Subsequent sample processing (preconcentration on a Wilfley table, MI heavy mineral concentration, paramagnetic separation, microscopic identification) was carried out in a private laboratory, IOS Services Géoscientifiques Inc., which was also in charge of selecting kimberlite indicator minerals for microprobe analysis.

The two picroilmenite grains were found in separate samples (01-PIA-524 and 01-PIA-543) located respectively in the SW and NE corner of the map area. Their magnesium and chromium contents (Table 1) are typical of mantle-derived ilmenites (Mitchell, 1986). Sample number 543 was collected from cobble gravel sediment with a maximum clast diameter of about 30 cm; at that location, the esker is located within a graben containing remnants of the Proterozoic Sakami Formation (Gosselin ***et al.***, in preparation). Sample number 524 was also collected from cobble gravel sediment, but with a smaller maximum clast diameter (20 cm); only Archean rocks have been mapped thus far in the vicinity of this esker. The coarse mean grain size (> 8 cm) of the sediments at both sampling sites may explain why Cr-pyropes were not found in the initial stage of this survey.

A reconnaissance survey of the succession of regional glacial movements was also carried out. Following a previously described methodology (Parent ***et al.***, 1995), sheltered facets of rock outcrops were searched for glacial striae. Such sheltered facets were observed at 16 of the 19 sites visited during the summer of 2001. In spite of this small observational base, the following succession of three (3) main glacial movements has been recognized (from youngest to oldest) :

* The latest and regionally dominant ice-flow direction is towards 260° in this region (Figure 1) which is located on the western flank of the regional ice divide. Ice flow is essentially the same as the previously observed directions in adjacent regions to the west (Parent ***et al.***, 1995) and south (Veillette ***et al.***, 1999). Prominent westward-trending dispersal trains, e.g. Lac-à-l'Eau Claire impactites (Parent ***et al.***, 1995) and Lac Fagnant volcanics (Parent ***et al.***, 1996) which are associated with this regional glacial movement suggest that it is the most important vector in terms of glacial transport.

* The penultimate ice-flow direction towards the NW was observed at most sites throughout the region (Figure 1). Its impact on the glacial transport from small sources such as kimberlite pipes is unknown; however, there is a distinct possibility that palimpsest dispersal trains such as at nearby Lac Fagnant (Parent ***et al.***, 1996), also occur in this region.

* The oldest ice-flow episode recorded in this area is towards the NNE. Sheltered glacial striae with directions

Table 1 Microprobe analysis of two picroilmenite grains found in esker sediments of the Lac Bienville map area (NTS 33 P).The results are expressed as percentages.

Sample number	Easting Nad 27	Northing Nad 27	SiO_2	TiO_2	Al_2O_3	Cr_2O_3	Fe_2O_3	Nb_2O_3	MgO	CaO	MnO	FeO	ZnO	Na_2O	Total
01-PIA-524	581 872	6126 256	0,03	48,23	0,52	0,94	24,41	0,23	9,92	n/d	0,24	15,54	0,03	0,03	100.11
01-PIA-543	671 207	6192 416	0,07	48,15	0,53	0,68	25,36	0,19	9,54	n/d	0,27	16,44	0,02	0,06	101.28

Microprobe analyses were performed in the microanalysis laboratory, Laval University

ranging from 360° to 035° were found at 7 of the 19 outcrops visited last summer. In view of its fragmented erosional record, it is doubtful that recognizable dispersal patterns can be associated with this glacial movement; however, its impact may be that fairly obtuse dispersal fans should be expected in the region.

Because the kimberlite indicator minerals of the Lac Bienville region are found at least 300 km north of the Otish Mountains diamond play, they most likely come from other sources that may be located within or near the Cambrien-Saindon corridor (Figure 2). The location of the Lac Bienville picroilmenites is directly aligned with G9 garnets reported by BHP at the eastern end of that corridor (Girard, R., 1999). Thus they confirm the high potential of the region for diamond exploration.

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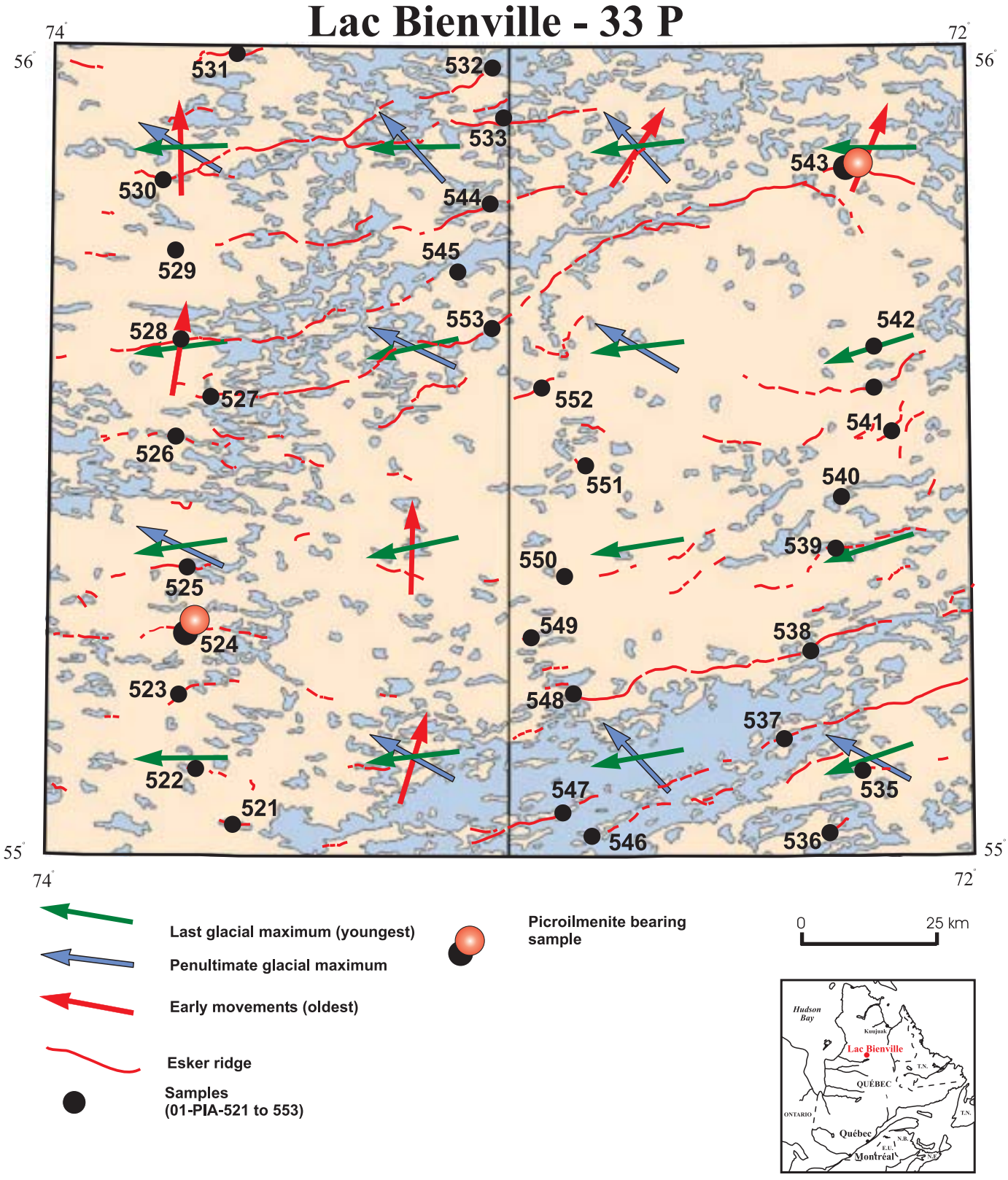

FIGURE 1 - Location of kimberlite indicator minerals (#524 and #543) in the esker sample suite from the Lac Bienville area. Ice-flow successions and esker ridges are also shown.

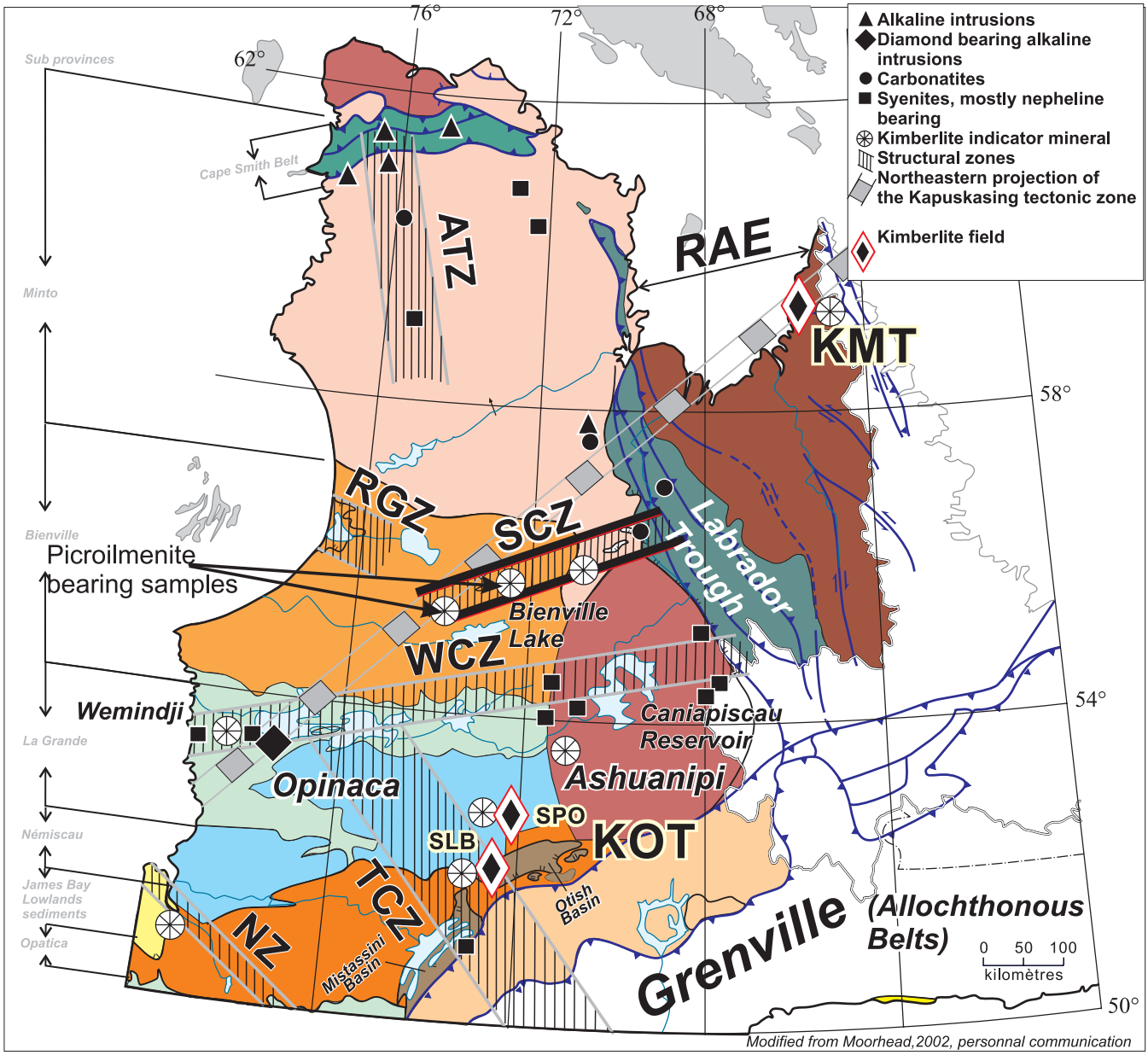

FIGURE 2. Tectonic sub-divisions of Quebec (Hocq, 1994) with the location of large-scale brittle/ductile fault zones and alkaline intrusions. Structural zones: ATZ: Allemand-Tasiat Zone, RGZ: Richmond Gulf Zone, SCZ: Saindon-Cambrian Zone, WCZ: Wemindji-Caniapiscau Zone, TCZ: Témiscamie-Corvette Zone, NZ: Nottaway Zone, WSZ: Waswanipi-Saguenay Zone, MCZ: Mégiscane-Chasseur Zone. Kimberlite Fields: KMT: Torngat ; KOT : Otish ; SPO : Portage area; SLB : Beaver Lake area;

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