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Platinum-group element contents of some Karelian and Kaapvaal kimberlites: implications for the PGE budget of the sub-continental lithospheric mantle

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Group I and Group II kimberlites from the Karelian and Kaapvaal cratons have <4 ppb Pt+Pd, and Pt/Pd around unity. These PGE levels are markedly lower than those reported previously for kimberlites from South Africa, Brazil and India. Primitive mantle normalised chalcophile element patterns are relatively unfractionated for the PGE, except for Cu and Au that are enriched relative to the PGE. Pd/Ir ratios average 1.5, the lowest of any mantle melt known. The PGE systematics can be largely explained by two components, (i) harzburgite/ lherzolite detritus of the SCLM with relatively high bulk PGE contents and high IPGE/PPGE ratios, and (ii) highly PGE depleted basaltic melt, likely formed through low degrees of asthenospheric mantle melting. The data indicate that the metasomatised component of the SCLM is relatively PGE poor. This suggests that the PGE enrichment in certain flood basalts and Bushveld magmas is not derived from the SCLM, and that the SCLM plays, at best, a passive role in the PGE fertility of the magmas, contrary to suggestions by some previous authors. The concentrations of the IPGE in the kimberlites have been used to estimate the proportions of mantle detritus in the magma (3-30%) and the composition of the melt component of the kimberlites. The Gp II melt is markedly less magnesian and less siliceous, but more calcic and potassic than the Gp I melt.

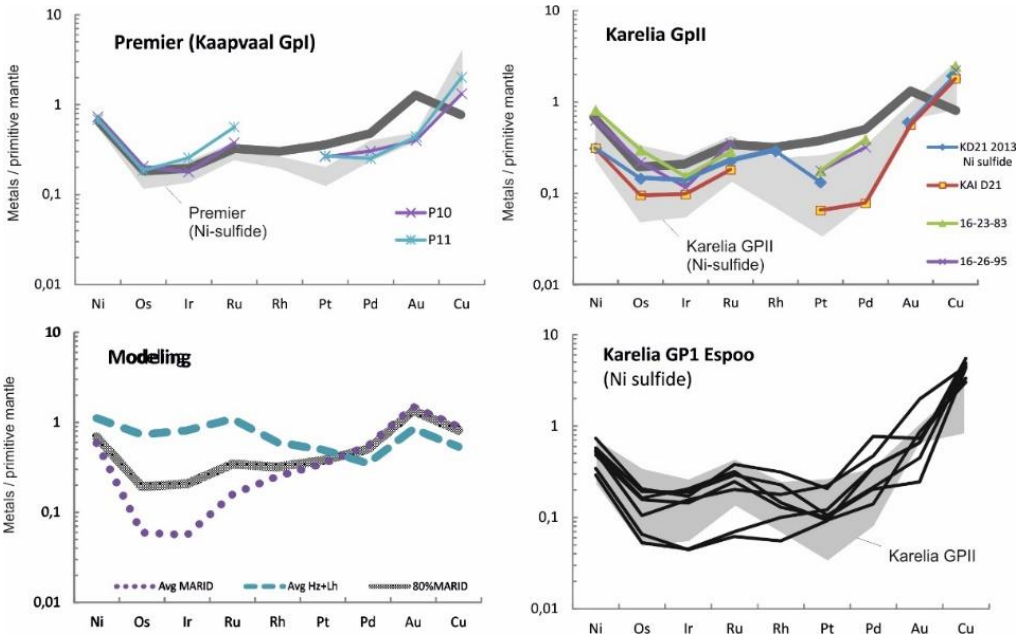

Figure 1: PGE patterns of kimberlites, normalized to primitive mantle (normalization factors from Barnes and Maier [1]). Coloured lines in (a) and (b) are isotope dilution data, black lines and grey shaded fields

are ICP-MS data. Data are best modelled by mixing of 20% SCLM and 80% MARID. Note that our ID data correlates well with Ni sulphide ICP-MS analyses.

References:

[1] Barnes S-J, Maier WD (1999) In: Geol Assoc Canada, Short Course Notes, 13.