PETROLOGY OF THE POSTMASBURG KIMBERLITES

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In an area of approximately 100 by 50 km, surrounding the Finsch Diamond Mine in the Northern Cape, South Africa, some 38 Group 2 kimberlites and/or kimberlite-like intrusives, probably of similar age, occur within what is termed the Postmasburg Area. Little geological evidence exists at surface to indicate that these bodies should be separated from other Group 2 kimberlites in this region of the Kaapvaal Craton. However, the geographic distribution of specific rock types within this area suggests that a distinct lithospheric domain may be defined.

The area is intruded by several diamondiferous and barren Group 2 kimberlites together with other kimberlite-like rocks. The latter include two bodies, located in the south-east, which are classified by Tainton (1992) as olivine lamproites (Blaauwklip - PK36 & Mooiplaats - PK37). These intrusives contain olivine phenocrysts in a groundmass consisting of phlogopite, diopside (often very coarse-grained and abundant e.g. Mooiplaats), leucite (only in Blaauwklip) and sanidine. Almost identical rocks have now been identified immediately to the north of the town of Postmasburg (Postmas 02 - PK11 & Compass - PK22). The rocks described by Tainton (op. cit.) are relatively isolated from other intrusives whereas those to the north of Postmasburg occur in close proximity to a variety of other kimberlitic rock types. These range from Group 2 kimberlites, such as the West End pipe, which are free of late-stage amphibole, leucite or sanidine, to Group 2 kimberlites, such as the Makganyene pipe complex which in parts contains some of the late-stage mineralogical features akin to olivine lamproites. All of the lamproitic rocks in this domain contain relatively abundant olivine. No olivine-poor or olivine-absent lamproites, which are typical of lamproite provinces elsewhere in the world, exist.

The lamproitic intrusives of the Postmasburg area are characterised by elevated SiO_2 and K_2O contents and lower MgO contents relative to the Group 2 kimberlites in this region (fig 2 & 3). Preliminary isotopic data indicate derivation of both lamproitic rocks and Group 2 kimberlites from a mantle source characterised by time-averaged incompatible element enrichment.

The petrological evidence obtained in this study indicates that the olivine lamproites represent end-members of a spatially and temporally related suite of rocks that are dominated by Group 2 kimberlites. A model of related petrogenesis for all of the observed petrographic variants is proposed.

REFERENCES

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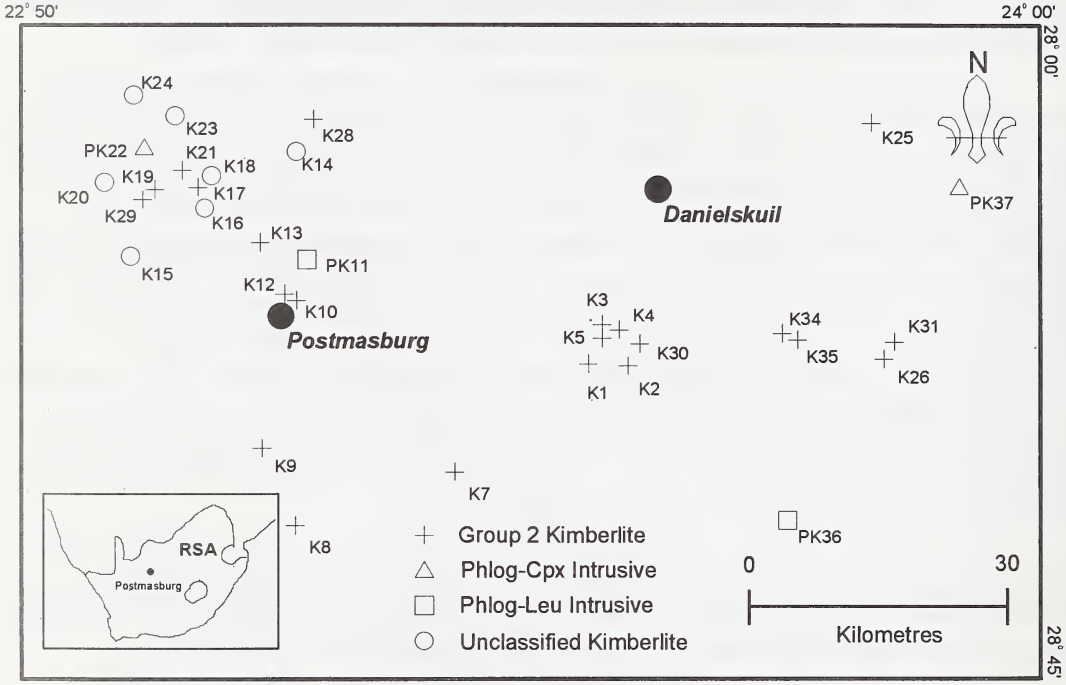

Figure 1. Distribution of kimberlites and related rock types in the Postmasburg area.

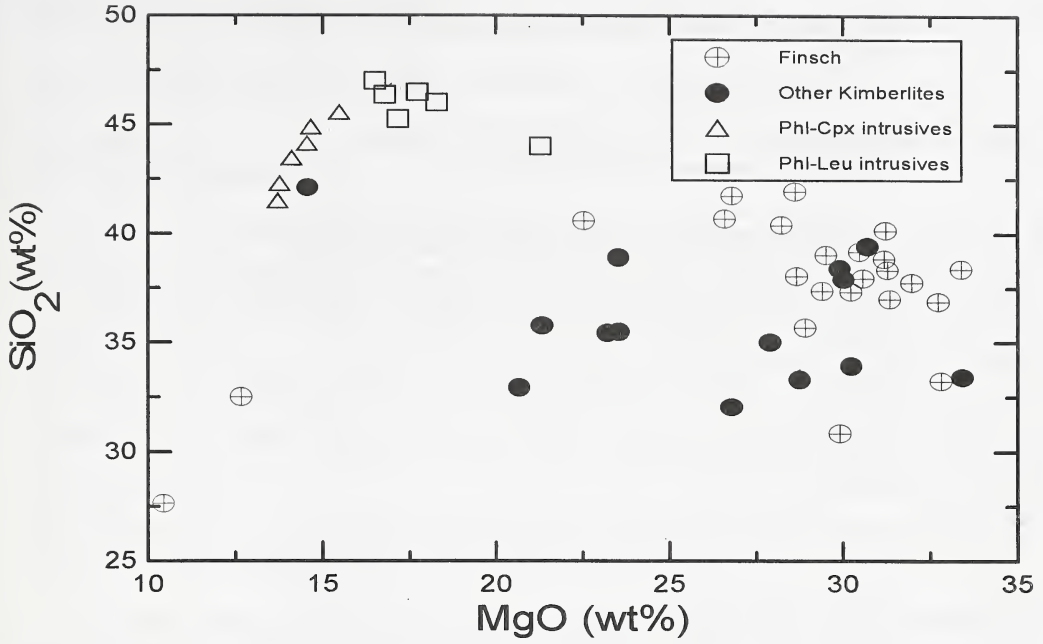

Figure 2. Plot of MgO vs SiO_2 for Postmasburg area kimberlites and lamproitic intrusives. Data sources this study, Fraser and Hawkesworth (1992) and Tainton (1992).

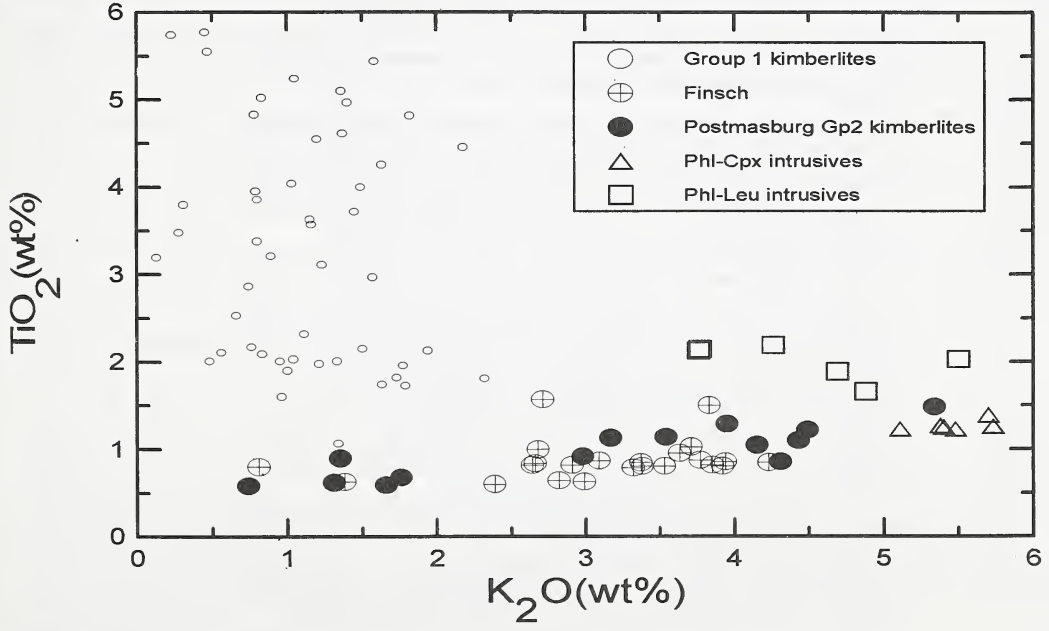

Figure 3. Plot of K_2O vs TiO_2 for Group 1 kimberlites (Wesselton and Kaalvallei) in relation to the Postmasburg kimberlites and lamproitic intrusives. Data sources this study as well as Fraser and Hawkesworth (1992), Shee (1985), Stiefenhofer (1989) and Tainton (1992).