

KIMBERLITE STRUCTURAL ENVIRONMENTS AND DIAMONDS IN BRAZIL.

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Diamond-bearing source rocks worldwide are recognized as occurring within cratonic areas stabilized by 1,500 Ma (Clifford, 1966; Atkinson, 1989). In most cases these areas coincide with ancient (>2.5 Ga) Archean nuclei (eg. South Africa, USSR; Mitchell, 1986) but in others with younger (~1.5Ga) Proterozoic mobile belts (eg. North Western Australia; Atkinson, 1989). Diamond-bearing primary sources within ancient Archean nuclei appear to be confined to kimberlite source rocks, and lamproites to Proterozoic mobile belts. Exceptions do exist, for example at Eureka (Scott-Smith et al., 1984), where diamondiferous kimberlite dikes occur within a late Proterozoic mobile belt.

Four cratonic blocks are recognized in Brazil (Fig. 1) and are defined as areas not affected by the Pan-African age Brasiliano event (Schobbenhaus and Campos, 1984). South of the São Francisco craton of Schobbenhaus and Campos (1984) occurs a larger area referred to by Almeida (1981) as the Paramirim craton. The boundaries of the Paramirim craton are defined by a zone of crustal thickening as determined from regional Bouguer anomaly profiles (Haralyi and Hasui, 1982). The São Francisco craton is not defined by regional gravimetrics.

Brazil is the world's eighth largest diamond producer but currently has no mines based on a primary source. Fourteen kimberlite/"lamproite" provinces are now known and all occur along one of three principal lineaments (Fig. 1): the NE-SW trending Transbrasileano lineament; the NW-SE striking lineament 125°AZ, and the Blumenau lineament. The principal diamond productivity in Brazil is confined to Lower Proterozoic to recent age, sediment-hosted deposits (Tompkins and Gonzaga, 1989) either on the Amazônico Craton, or on and to the west of, the São Francisco Craton; often both in regions where kimberlite and related rocks occur.

Known kimberlites on the Amazônico Craton (locations 1-4; Fig. 1) occur in the Rio Negro-Juruena Mobile Belt, in a zone that was cratonized by 1.5 Ga (Teixeira et al., 1989). Kimberlites, "lamproites", and related rocks to the west of the São Francisco craton all occur within the limits of the reworked Paramirim craton (Fig. 1), in a zone that was consolidated in the Jequi event (2.7 Ga), and partially reworked during the Uruaçuano (1,300 - 1,000 Ma), and Brasiliano (450-700 Ma) events.

The economic potential of the kimberlites and related rocks is unknown, but, diamonds are reported from kimberlites on the Amazônico and Paramirim craton areas. Preliminary mineral chemical data of garnet inclusions in diamonds from the Juina kimberlite field (Locality 4; Fig. 1) suggest magma sampling from deep (>200km) upper mantle, possibly asthenospheric, source regions (Wilding et al., 1989) at this locality. Shallower level xenolith signatures are recorded from the area to the southwest of the São Francisco craton (locations 8,9 of Fig. 1; Svisero et al., 1984; and location 7 of Fig. 1; Tompkins, 1987). Analyses of heavy mineral concentrates from two pipes near the edge of the São Francisco

craton (location 10; Fig. 1) indicates that these magmas sampled garnet peridotite (Tompkins and Ramsay, 1991).

It would appear that Clifford's (1966) rule for kimberlites is applicable to Brasil. The potential for non-kimberlite diamond source rocks in Brasil may possibly be extended to include areas within the larger, partially reworked, Paramirim craton. However, considerably more data are required to better define the tectonic settings, the distribution of various alkaline rock types present, the relative timing of emplacement of these intrusions, and the types of mantle sources sampled by these rising magmas. This data, coupled with diamond inclusion mineralogy, should enable better geochemical and tectonic modeling of the regions in question.

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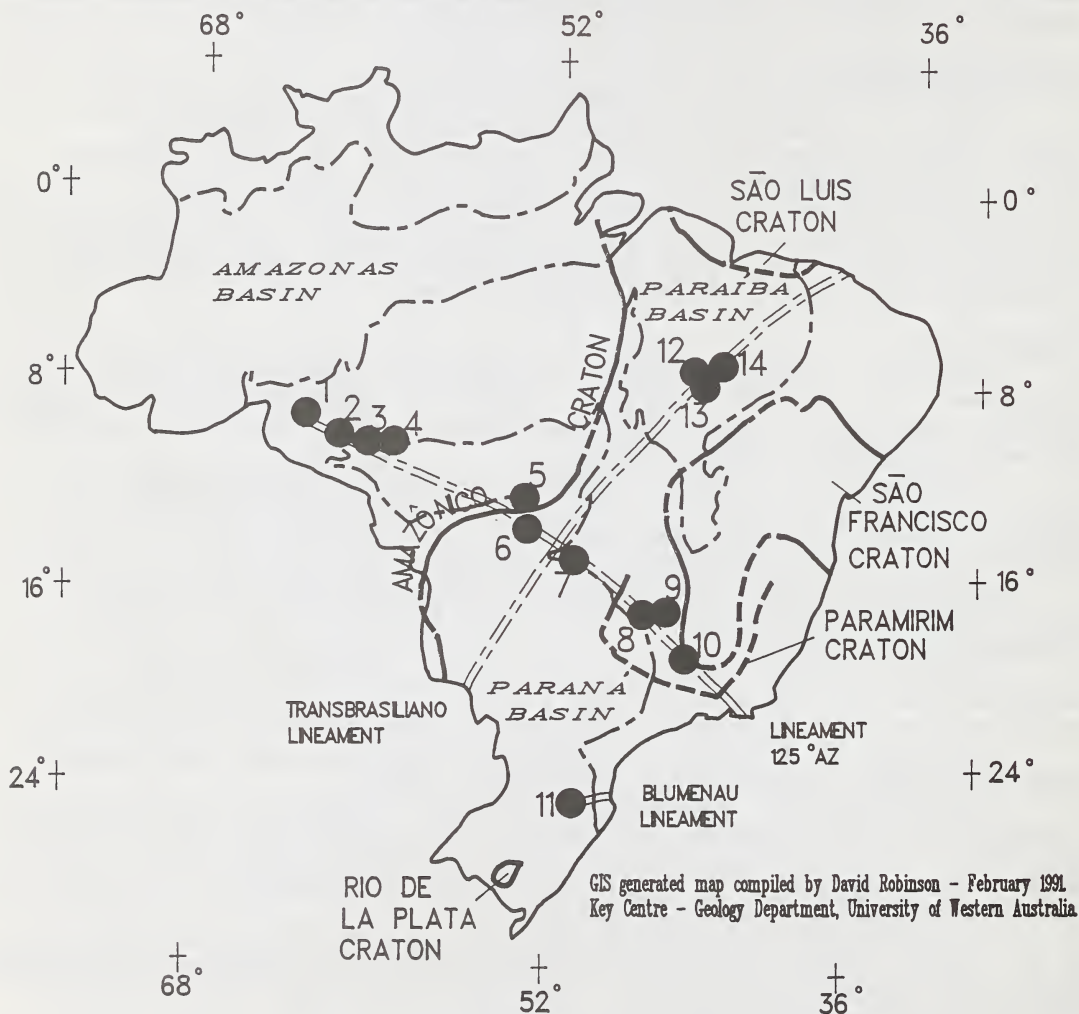


Figure 1. Principal structural environments in Brasil from Schobbenhaus and Campos (1984) and Almeida (1981). The solid circles refer to kimberlite/lamproite provinces from Tompkins and Gonzaga (1989) and A.J.A. Janse (pers. comm., 1990) and, are identified as follows: 1=Arquemes; 2=Pimenta Bueno; 3=Vilheno; 4=Aripuãna (Juina); 5=Paranatinga (Batovi); 6=Poxereu; 7=Amorinópolis; 8=Alto Paraníba; 9=Presidente Olegário; 10=Bambui; 11=Lajes; 12=Redondão; 13=Santa Filomena-Bom Jesus (Gilbues); 14=Picos.