

IS THE RIO GRANDE ARCH A STRUCTURAL FEATURE OR A DEEP SEATED UPLIFT? EVIDENCES FROM MESOZOIC ALKALI DOLERITES OF RIO GRANDE DO SUL, BRAZIL.

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The Mesozoic alkali dolerites of Rio Grande do Sul State, Brazil are represented by dykes and sills of olivine-dolerites with 130 Ma ages, whose emplacement is controlled by N-W to E-W fractures. These dikes and sills occur exclusively in the Sul-rio-grandense Shield (Rio Grande Arch) beyond the borders of the Paraná Basin with its Mesozoic tholeiitic basalts. Both associations were formed simultaneously at the same temperature by the partial melting of asthenospheric mantle in the central zone of the Tristão da Cunha Plume with some probable contamination of the tholeiitic magmas by the lithospheric mantle and continental crust. This is showed by trace element composition and positive ϵ_{Nd} (+4 to +5) and ϵ_{Sr} next to zero (-3 to +4) of alkali dolerites and negative ϵ_{Nd} (0 to -8) and high positive ϵ_{Sr} (0 to +150) of tholeiitic basalts.

Basic alkaline magmas can be formed from the same mantle source as tholeiitic magmas at similar temperatures by partial melting but only at higher dry pressures. The origin of the Mesozoic alkaline dolerites from the Rio Grande do Sul State demands a higher lithostatic pressure than the tholeiitic volcanism of the Paraná Basin, because both were formed at the same temperature, as showed by plagioclase and pyroxene geothermometers ($T \approx 1200$ °C.) This difference in pressure was probably caused by the greater thickness of the continental lithosphere in the Rio Grande Arch Area than in the interior of the Paraná Basin with its tholeiitic volcanism. By this reasoning the so called Rio Grande Arch results from thicker lithosphere rather than shallow tectonic uplift.