$^{87}Sr/^{86}Sr$ and $^{207}Pb/^{204}Pb$ Dupal signature coupled to E-MORB REE patterns in the Ferrar magmatism: a time-integrated effect of an old E-MORB type mantle enrichment process?

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The Jurassic Ferrar magmatism consists of low-TiO_2 tholeiitic rocks bordering the proto-Pacific margin of Gondwana (Antarctica, Tasmania and New Zealand). The Ferrar tholeiites differs from low-TiO_2 analogues of Paranà (Early Cretaceous) and Karoo (Jurassic) LIPs for their higher SiO_2 content (>52 wt%) associated to invariably high initial $^{87}Sr/^{86}Sr$ (>0.707) and low $^{143}Nd/^{144}Nd$ (<0.5124). The correlations of Sr-Nd isotopes versus major and incompatible trace elements, are consistent with fractional crystallization associated with assimilation of granulitic rocks from Antarctica. The REE patterns of the least evolved Ferrar tholeiites can be explained by a model whereby primary Ferrar magmas, generated through high degree of melting of an E-MORB type mantle source, underwent low-pressure AFC processes acquiring their crustal signature. Such model constrains the Sr-Nd-Pb isotopic compositions of Ferrar mantle source to approach those of the present Dupal basalts, differing from those of typical E-MORB. Nd-model ages indicate that the enrichment event(s) of the source mantle may have occurred in Precambrian times. In comparison with "uncontaminated" low-Ti Paranà tholeiites, the primary Ferrar magmas would have lower incompatible element contents and higher $^{206}Pb/^{204}Pb$, indicative of distinct geochemical domains in the subcontinental mantle of Gondwana.