TWO DISTINCT MAGMATIC LINEAGES FROM THE WARRUMBUNGLE VOLCANO, NEW SOUTH WALES, AUSTRALIA

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The basic rocks with high Mg# values and few phenocrysts from the large Early- to Mid-Miocene Warrumbungle Volcano are grouped into two series, the IER (incompatible elements-rich) and the IEP (incompatible elements-poor) series. The former is mainly silica-undersaturated and richer in incompatible elements such as K and Rb, HFSE (Zr, Ta and Nb), and LREE (La and Ce), as compared with the IEP series which is mainly silica oversaturated. These two series reveal the geochemical characteristics of two distinct mantle sources: an amphibole-bearing garnet-lherzolite and a depleted spinel-lherzolite. Partial melting of the amphibole-bearing garnet lherzolite mantle took place within a rising mantle plume. The plume impinged on the base of the Australian plate as it moved northward. At higher mantle levels this same thermal event promoted a larger degree of partial melting of a spinel-lherzolite in the sub-continental lithospheric mantle. This source rock had previously experienced an enrichment phase followed by a depletion event.The geochemistry of the IEP series has been linked to the major and trace element variations found in a set of subcalcic clinopyroxene and orthopyroxene megacrysts hosted by these rocks. The megacrysts crystallized at high pressure (0.8-1.2GPa) indicating that the basic rocks of the IEP series are products of high pressure fractional crystallisation involving subcalcic clinopyroxenes± orthopyroxenes. The basic rocks from the IER series, however, seem to have maintained the geochemical characteristics obtained during the partial melting event that produced them. Olivine phenocrysts with rare Cr-spinel inclusions in the IER series indicate its low-pressure differentiation history.