

Source of isotope enrichment of East Antarctic plume-related magmatism

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The Mesozoic magmatism of eastern Antarctica is characterized by the development of high-magnesian basic rocks in the form of dikes, stocks, sills and basalt flows in a vast territory and is associated with the impact of two large mantle plumes - Karoo (180-170 Ma) in the western part and Kerguelen (130-120 Ma) in the eastern, on the ancient Gondwana lithosphere, which was the main source of enrichment of mantle melts. The nature and degree of enrichment of plume-related magmas according to isotope (Pb-Sr-Nd-Hf-Os) characteristics varied in space and time:

- the source of high-Fe melts in the western part (Queen Maud Land) was the material of the ancient basic eclogite formed as a result of subduction of the oceanic crust, and turned into a pyroxenite melt (with LoMu + EMI characteristics) when interacting with the mantle peridotite 180 m.y. ago. The presence of such basalts only in the central part of the plume and in the earliest injections indicates to the evolved plume composition with a decrease of pyroxenite admixture in the source and an increase share of the enriched EMII-type component - the melting lithospheric mantle;

- alkaline-ultrabasic rocks from the northern part of the Lambert Glacier paleorift formed during the Cretaceous under the influence of a CO₂-enriched fluid are associated with melting at a depth of 130 - 140 km of the ancient metamorphosed mantle, similar to the Kerguelen Plateau mantle, under the thermal impact of the plume on the margins of the expanding continental blocks of India and East Antarctica. The formation of the LoMu-enriched lamproites of the Cenozoic Gaussberg volcano on the Antarctic coast is associated with a long-lasting development of the Kerguelen-plume until the present, sublithospheric spreading of the plume in the southeast direction and melting substantially enriched by volatile, lithophile elements and radiogenic Sr and Pb isotopes (²⁰⁶Pb/²⁰⁴Pb: 17.50, ²⁰⁷Pb/²⁰⁴Pb: 15.614-15.653, ²⁰⁸Pb/²⁰⁴Pb: 38.310-38.546, ⁸⁷Sr/⁸⁶Sr: 0.710, ¹⁴³Nd/¹⁴⁴Nd: 0.5120) metasomatized Gondwanian continental mantle.

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