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Tectono-magmatic evolution of the Karoo and Kerguelen plumes and their impact onto magmatism of the East Antarctica

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The Mesozoic Karoo-Maud and Kerguelen plumes had a significant influence on Gondwana and the oceanic lithosphere. Jurassic magmatism, formed under the influence of a huge Karoo plume at 184–178 Ma ago, covered large areas of the Dronning Maud Land in East Antarctica. Later, 130 – 0 m.y. ago, under the influence of the Kerguelen plume, magmatism formed in the area of the Lambert glacier, and the Gaussberg volcano (Quaternary time) appeared, located on the coast opposite the Kerguelen archipelago. We assume that the Karoo mantle plume initiated the formation of a “mega-apophyses” from the main plume manifestation area within the Karoo province in the southeastern African continent (ca. 2000 km in diameter). These mega-apophyses are represented by the Ferrar Igneous Province (ca. 3000 km long area of intrusive activity along the Transantarctic Mountains) and a supposed igneous province (ca. 1500 km long) covering the East Antarctic coast between the Lazarev and Cosmonauts Seas. Based on petrological and geochemical studies, the characteristic features of magmas of the Karoo, Dronning Maud Land, and Ferrar igneous provinces have been determined, which indicate that for all magmas associated with Karoo and Kerguelen plumes, the main source of melt enrichment is a mantle source with characteristics of the EM-II component (most typically for magmas of the Ferrar Province). It reflects the properties of an enriched, fluid-rich, ancient continental mantle, metasomatized at the early stages of the tectonic development of the region and involved in the melting process. A rarer admixture of the ancient lithospheric component (EM-I, with $^{206}\text{Pb}/^{204}\text{Pb} = 16.5$ and $^{143}\text{Nd}/^{144}\text{Nd} = 0.5122$) was revealed in both plumes. The existence of mantle plumes in the Southern Hemisphere and their long-term development had a significant impact on the structure and evolution of the East Antarctica.