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The magmatism of hot spots and spreading zones of the South Atlantic and the eastern Indian Ocean as a result of mantle plume activity from 130 m.y. ago: the Tristan and Kerguelen plumes

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Two mantle plumes - Tristan (Parana-Etendeka) in the South Atlantic and Kerguelen in the eastern Indian Ocean, began to develop almost simultaneously about 130 m.y. ago symmetrically with respect to the Karoo-Maud plume. The enriched characteristics of the magmas formed, as well as trap, or hot spot - and spreading zone-related, are inherited from the enriched lithosphere source. Geochemical study of drill hole 513a basalts (71 leg DSDP) showed that during of the South Atlantic opening the Discovery hot spot impacted onto the spreading magmatism of SMAR in the region of 45-48°S as early as 40 m.y. ago. This is reflected in the appearance of high-temperature tholeiites (TOR-1 type), elevated Cu, Ag, Au (at MgO - 7-8 %) contents up to 110 ppm (Cu), 33 ppb (Ag) and 1.6-1.8 ppb (Au) more typical for plume components in the magma source, as well as in isotopic signatures close to the Discovery Rise basalt source. The Discovery hot spot may be a derivative of the Tristan plume system, and its occurrence and long-term impact on the spreading magmatism of the South Atlantic is seen as evidence of the extensive spatial propagating of the Tristan plume.
The influence of Kerguelen-plume had a significant effect on the formation of enriched tholeiitic magmas within the ancient spreading zone, and apparently continued until the Quaternary time, when the Heard Island began to form within the Kerguelen plateau, and the Gaussberg volcano on the East Antarctic coast. Plume substance distribution along the weakened zones suggests the probable existence of deep currents - plume movements occurring at different levels of the lithosphere and in the sublithospheric mantle. Lamprophyres from the Jetty oasis (East Antarctic) by age (117-110 Ma) and isotopic characteristics (averaged 143Nd/144Nd - 0.512485, 87Sr/86Sr - 0.70637, 207Pb/204Pb - 15.671, 206Pb/204Pb - 18.391, 208Pb/204Pb - 38.409) are close to the ultra-potassium alkaline basalts of the eastern India (Jharia and Raniganj lamproite intrusions (Chalapathi Rao et al., 2014). Their origin is associated with the melting of the continental lithosphere repeatedly transformed during the Gondwanaland formation. The similar composition of mantle inclusions in the alkaline magmas of the Kerguelen archipelago, eastern India, and Antarctica supposes that the India and East Antarctic cratonic mantle could be formed under similar geodynamic conditions, and its fragments were carried to the surface as a result of the magmatic activity of the Kerguelen plume. Re-Os isotope systematics of mantle nodules from Jetty oasis indicate the beginning of lithospheric mantle formation in this region of the East Antarctic craton was as early as 2400 m.y. ago.