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Oceanic magmatic evolution during ocean opening under influence of mantle plume

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Petrology, geochemistry and geophysics as well as numerical simulation of spreading processes in plume impact environments on examples of Atlantic Ocean Iceland and the Central Atlantic plumes and Kerguelen plume in the Indian Ocean reveal:
- under interaction of large plume and continental landmass the plume can contribute to splitting off individual lithosphere blocks, and their subsequent movement into the emergent ocean. At the same time enriched plume components often have geochemical characteristics of the intact continental lithosphere by early plume exposure. This is typical for trap magmatism in Antarctica, and for magmatism of North and Central Atlantic margins;
- in the course of the geodynamic reconstruction under the whole region of the South Atlantic was formed (not in one step) metasomatized enriched sub-oceanic mantle with pyroxenite mantle geochemical characteristics and isotopic composition of enriched HIMU and EM-2 sources. That is typical for most of the islands in the West Antarctic. This mantle through spreading axes jumping involved in different proportions in the melting under the influence of higher-temperature rising asthenospheric lherzolite mantle;
- CAP activity was brief enough (200 $\pm$ 2 Ma), but Karoo-Maud plume worked for a longer time and continued from 180 to 170 Ma ago in the main phase. Plume impact within Antarctica distributed to the South and to the East, leading to the formation of extended igneous provinces along the Transantarctic Mountains and along the east coast (Queen Maud Land province and Schirmacher Oasis). Moreover, this plume activity may be continued later on, after about 40 million years cessation, as Kerguelen plume within the newly-formed Indian Ocean, significantly affects the nature of the rift magmatism;
- a large extended uplift in the eastern part of the Indian Ocean – Southeastern Indian Ridge (SEIR) was formed on the ancient spreading Wharton ridge near active Kerguelen plume. The strongest plume influence on the SEIR formation occurred 70-50 mln years ago, when the process of primary magma generation happened at high degrees of melting (up to 30%), which is not typical for spreading ridges of the Atlantic and Pacific Oceans. According to geochemical characteristics of the Kerguelen Plateau and SEIR magma sources close to each other, and have an enriched source of more typical for Kerguelen plume magmas and diluted by depleted substance for SEIR melts. Appearance of magmatism on the Antarctic margin about 56 thousand years ago, in the form of a stratovolcano Gaussberg indicates sublithospheric Kerguelen plume distribution in the south-west direction. The source of primary magmas (lamproite composition) is an ancient Gondwana lithosphere, has undergone repeated changes in the early stages of evolution during which it was significantly enriched in volatile and lithophile elements, and radiogenic Sr and Pb.