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Karoo-Maud plume - evolution within the Antarctic and its influence upon the magmatism of the Indian Ocean

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The history of the South Ocean formation and evolution is directly connected with disintegration of Gondwana supercontinent with the preceding intensive magmatism developed in South Africa (Karoo Province) and Eastern Antarctic (Queen Maud Land (QML) and Transantarctic Mountains) (White & McKenzie, 1989).

The carried out investigation of Mesozoic magmatism in Schirmacher oasis (SO) located about 15˚ to the west of Ahlmanryggen dyke complex (the most eastern part of Maud plume magmatism) has shown that basalts and dolerites from SO by their chemical composition belong to tholeiites and alkaline basalts with some variation of sodium (from 0.3 to 1.5 %) and are close by all parameters to plateau basalts of QML for which there have been distinguished several geochemical types with different range of crust contamination (Luttinen & Furnes, 2000). Peculiar feature of these magmas is the presence of high Mg olivines (Fo: 90-91). The age of the studied dykes from SO determined by Sm-Nd isochron method for rock-forming minerals and whole-rock sample of olivine dolerite is 171±12 Ma and evidence to the duration of trap formation in Antarctic as long as 10 m.y. at least (Belyatsky et al., 2006) which correspond to the time of Karoo province formation.

Geophysical investigations of the basement of the Cosmonaut Sea basin – Cooperation Sea and the basin of the Davis Sea evidence that the early stages of the ocean opening took place at moderate spreading velocities. At the same time there were formed volcanic raisings with the age 110-90 Ma observed in the western part of the Riser-Larsen Sea (the Astrid Ridge), the Lazarev Sea, in the south-eastern part of the Weddell Sea (Hinz & Krause, 1982) and on the Bruce Bank (to the west of Kerguelen Plateau), in

the south-eastern part of the Davis Sea. Also it is found out that the basement is made up mostly by volcano-sedimentary rocks with layers of tholeiite basalt lavas formed, as a rule, under subaerial conditions. Such feature could reflect the super plume (Karoo-Maud) influence upon oceanic crust formation in this region when it was developing in the east direction till the deep rift zone of old origin (Lambert-Amery and Prydz Bay) with inherited structure of Paleozoic grabens and filled with sediments about 10 km thick (Leitchenkov et al., 1999) and, perhaps, it separates different blocks of Antarctic continental lithosphere (possibly, of different thickness to the West and East from it). The further distribution of plume took place towards the already formed oceanic basin and caused formation of the volcanic seamountains: Conrad Rise, Kerguelen Plateau, Af.Nikitin Seamount, South-East Ridge along the proto-Southeast Indian Ridge. Distribution of plume magmas to the East along the old collision zone reflects the processes which took place in the plumes at about 180-110 m.y. ago. The obtained data for dolerites from SO have demonstrated that average composition of magmas correspond to $^{207}Pb/^{204}Pb$=15.502, $^{208}Pb/^{204}Pb$=38.114, $^{206}Pb/^{204}Pb$=18.026, $^{87}Sr/^{86}Sr$=0.70568, $^{143}Nd/^{144}Nd$ =0.512629. These data are similar to the compositions of olivine tholeiites from the old Af.Nikitin Seamount formation of which took place about 90 m.y. ago close to the proto-Southeast Indian Ridge (Borisova et al., 2000).

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