



Geochemical features of Jurassic mafic dykes from the Schirmacher Hills (central Dronning Maud Land, Antarctica)

N.M. Suschevskaya (1), B.V. Belyatsky (2) and E.V. Mikhalsky (3)

(1) Vernadsky Institute of Geochemistry, RAS, Moscow, Russia (nadyas@geokhi.ru), (2) Institute of Precambrian Geology, RAS, St.Petersburg, Russia, (3) VNIIOkeangeologia, St.Petersburg, Russia

Formation of the Southern Ocean was directly related to the Karoo - Maud mantle superplume activities, which enabled subsequent Gondwanaland break-up. The main magmatic phase was dated at 183-180 Ma, but the magmatic activities lasted until 145 Ma (South Africa), and 159 Ma (Antarctica). Mafic potassic magmas derived by partial melting of metasomatically enriched mantle lithosphere post-date the eruption of flood basalts (Gibson et al., 1999; Vuori & Luttinen, 2003). This may serve evidence for the spatial distribution of the melting area initiated by the super-plume beneath the continents.

Within the Antarctica the MZ basalts were observed along the Transantarctic Mountains (Ferrar Province) and in the western part of the Dronning Maud Land (DML). In the Schirmacher Hills (central DML) dolerites form a mafic dyke swarm. Jurassic age of these dykes was obtained by Wand (1995). We studied the mineral phase compositions and geochemical features of olivine-bearing dolerites and gabbro-dolerites from the Schirmacher Hills.

Our research includes petrological modelling, and enables initial magma composition and generation conditions being assessed. The findings of high-Mg olivines commonly lacking from continental flood basalts and dykes reflect fast magma ascent to the middle-crust magma chambers, and reveals a peculiar feature of the Karoo - Maud superplume in Antarctica. The composition and evolution of mafic magmas in the Schirmacher Hills are found similar to those of mildly enriched Vestfjella basalts and Muren gabbro which were related to initial superplume magmatism in the western

DML (Luttinen and Furnes, 2000; Vuori and Luttinen, 2003). The obtained geochemical data has demonstrated that the Schirmacher Hills dolerites have less enriched character than the Vestfjella and Ferrar Province basalts.

The Mesozoic dolerites, and the Proterozoic metadolerites in the Schirmacher Hills have similar Pb isotope compositions. MZ dolerites have higher Ti₂ and lower Si contents as compared with the Proterozoic dykes, which is typical for the MZ and PR dyke complexes in South Africa. The dyke complexes related to the Karoo magmatic activity took place along the reactivated Proterozoic structures in South Africa (Jourdan et al., 2004). Thus within the Antarctic the Jurassic magmatism spread not only in the direction of the Transantarctic Mountains, but also to the east possibly along the graben-like offset of the Weddell Sea rift system (Vuori and Luttinen, 2003) where an old dyke complex occurred. In the course of the MZ melts ascending to the middle crust they probably underwent contamination acquiring the geochemical features of old magmas.

Support -Grant RFFR05-03-64573

References

Gibson S.A., Thompson R.N., Leonardos O.H., Dickin A.P. and Mitchell J.G. The limited extent of plume-lithosphere interactions during continental flood-basalt genesis: geochemical evidence from Cretaceous magmatism in southern Brazil. *Contrib. Mineral. Petrol.*, 1999, v.137, 147-169.

Jourdan F., Feraud G., Bertrand H., Kampunzu A.B., Tshoso G., LeGall B., Tiercelin J.J. and Capiez P. The Karoo triple junction questioned: evidence from Jurassic and Proterozoic ⁴⁰Ar/³⁹Ar ages and geochemistry of the giant Okavango dyke swarm (Botswana). *Earth and Planet. Sci. Letters.*, 2004, v.222, 989-1006.

Luttinen A.V. and Furnes H. Flood basalts of Vestfjella: Jurassic magmatism across an Achaean – Proterozoic lithospheric boundary in Dronning Maud Land, Antarctica. *Journal of Petrology*. 2000, v.41 (8), 1271-1305.

Luttinen A.V., Zhang X. and Foland K.A. 159 Ma K₂O-rich lamproites (Dronning Maud Land, Antarctica) and their implications for Gondwana breakup processes. *Geol. Mag.*, 2002, v.139 (5), 525-539.

Vuori S.K. and Luttinen A.V. The Jurassic gabbroic intrusions of Utpostane and Muren: insights into Karoo-related plutonism in Dronning Maud Land, Antarctica. *Antarctic Science*, 2003, v.15 (2), 283-301.

Wand U. Petrography and petrochemistry of dykes. In: Bormann P. and Fritsche D. (Eds.) *The Schirmacher Oasis, Queen Maud Land, East Antarctica, and its surround-*

ings. Gotha, Justus Perthes Verlag, 1995, 109-112.