Geophysical Research Abstracts
Vol. 12, EGU2010-2103, 2010
EGU General Assembly 2010

A link between geochemistry and geodynamics: carbonatites and kimberlites, Polar Siberia

Irene Rass

Institute of Geology of Ore Deposits, Petrography, Mineralogy & Geochemistry, Russian Academy of Sciences, Moscow, Russian Federation (rass@igem.ru)

Geophysical evidence indicates that the Moho surface beneath the northern Siberian Platform composes crests (or ranges) up to 14 km high above deeper areas and 50-80 to 150 km wide (Chernyshov and Bokaya, 1983). These ranges at the Moho likely mark ancient rift zones with a thinner crust.

More than 70% kimberlites in structures surrounding the Anabar Shield occur along these Moho crests (Kravchenko et al., 1997; Rosen and Kostyuchenko, 1998). Carbonate-rich rocks that compose pipes, along with kimberlites, in kimberlite fields, were recognized as an individual type of carbonatite rocks: kimberlitic carbonatites (Lapin and Marshintsev, 1984). They abound in kimberlite fields of both Paleozoic and Mesozoic age southeast and east of the Anabar Shield. The liquidus temperatures of related kimberlites, determined based on their major-component chemistries, are 1429-1441C and 1349-1518C, respectively (Perchuk and Vaganov, 1980). Compared to classic carbonatites in ring complexes, kimberlitic carbonatites are characterized by the lowest relative concentrations of P and Sr, slightly lower REE, and high contents of Cr, Ti, and Zr (Rass, 1998).

Mesozoic kimberlitic carbonatites exhibit a dependence of their geochemistry, position relative to the axial zones of the Moho crests, and the temperatures of the associated kimberlites, from the Kuoika to the Lower Kuonamka field: from <42 km and 1518 C to ∼50 km and 1395 C (Rass et al., 2000). Away from the maximum heights of the Moho crests, which mark ancient rifts in the northern part of the Siberian Platform and with a decrease in the liquidus temperatures of the associated kimberlites, the relative P and Nb concentrations in these rocks increase, and those of REE, Cr, and, to a lesser extent, Ni and Co decrease.

The depths of the Moho surface beneath carbonatites in Mesozoic ring structures of the Odikhincha, Guli, Magan, and Yraas complexes in the Maymecha-Kotui alkaline-ultrabasic-carbonatite province west of the Anabar Shield and in Maldzhangarka complex south of the Shield are 36, <42, 42-46, and 50 km, respectively. Their geochemical characteristics show analogous zoning relative to the axial zones of the Moho crests.

The geochemical features of kimberlitic carbonatites are controlled, first of all, by the partition coefficients of trace elements between the silicate and carbonate components of the deep-sitting magmas. Their experimentally determined parameters are still scarce (Green, 1994) and obviously insufficient for any conclusions about the physicochemical conditions of the exsolution and/or melting of the parental magmas, so that any empirical dependences the identified in them provide information on the lateral heterogeneity of the mantle material in the northern Siberian Platform.

References

Chernyshov N.V. and Bokaya L.I., in: Structural Elements of the Earth's Crust and Their Evolution. Nauka, Novosibirsk, 1983: 144-150 (in Russ.)

Green T.H. Chemical Geology, 1994, vol.117: 1-36

Kravchenko S.M., Schakhotko L.I., Rass I.T. Global Tectonics and Metallogeny, 1997, vol.6, No.2: 137-140

Lapin A.V., Marshintsev V.K. Geology of Ore Deposits, 1984, No.3: 28-42

Perchuk L.L., Vaganov V.I. Contrib.Mineral.Petrol., 1980, vol.72: 219-228

Rass I.T. Geochem. Int., 1998, vol.36, No.2: 107-116

Rass I.T., Ilupin I.P., Marchenko T.M., Schakhotko L.I., in: The 2nd Russ. Conf. Transactions, Syctyvkar, 2000, vol.4: 307-308 (in Russ.)

Rosen O.M., Kostyuchenko S.L., in: Khain V.Ye. (Ed.) Explanatory notes for the tectonic map..., Moskow, 1998: 10-42