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THE GULI ALKALINE-ULTRAMAFIC COMPLEX, NORTHERN SIBERIA, RUSSIA: MANTLE METASOMATISM AS THE GENETIC PROCESS

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The Guli Massif is located at the northern periphery of the Siberian craton within the Maimecha – Kotui Province, representing a multiphase, partly zoned carbonatite – alkaline – ultramafic complex. The massif is characterized by an oval shape and covers an area of 1500 – 1600 km^2. Detailed mineralogical, petrographical and geochemical investigations, defined a sequence of dunite core complex, clinopyroxenite, olivine melanephelinite and rocks of the ijolite series. Metasomatic processes seem to be of great significance during the genesis of the Guli Massif, observable in a pronounced enrichment trend of the LREE from the dunite core complex to the carbonatite intrusion, 10 times chondrite at the periphery of the dunite complex and up to 3000 times chondrite at the direct contact between the carbonatite and the ijolite.

The REE distribution patterns of the different rock types are used in this study, to model the genesis of the Guli Massif on the basis of magmatic processes, such as magma formation, fractional crystallisation and assimilation. It is shown, that two different metasomatic events took place during the genesis of the Massif:

(1) The genesis of the dunite – clinopyroxenite complex has been initiated by a mantle plume, which led to continuous and long lasting melting processes. Locally high melting rates and the formation of a multiplicity of small melt portions, significantly enriched in fluids and immobile elements, led to the formation of the dunite restite, characterized by a typical mantle texture and composed of ~ 96 modal% olivine. The migration of these melts into higher regions within the mantle plume and the associated contamination caused a mantle metasomatic overprint of the dunite, which is clearly verifiable by LREE enrichment throughout the whole dunite complex. The accumulation and crystallisation of the melts, generated during the slow uplift of the mantle material, caused the formation of an olivine – clinopyroxene cumulate at the periphery of the dunite body, and finally these melt fractions intruded the mantle as clinopyroxenite dykes.

(2) The origin of the zoned alkali – carbonatite – complex represents a second magmatic event, caused by further ascent of the already metasomatised mantle plume into higher levels. Lithospheric mantle regions, characterized by CO_2- and H_2O-rich fluids, are supposed to be the magma source. Initial melting processes, probably triggered by early rifting, caused the formation of melanephelinitic melts (olivine melanephelinite). Fractionation during the magma ascent in addition to the immiscibility of the silicate and the carbonatite liquid caused the formation of the ijolite and the carbonatite, metasomatically influencing their surroundings during final uprise and intrusion.

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