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Peculiarities of mantle lithosphere beneath the large kimberlite pipes in different regions for Siberian craton

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Comparison of the structure of the mantle columns and mineralogy of the large kimberlite pipes in Yakutia from the different regions, kimberlite fields and mantle terranes in Yakutia allowed several assumptions. 1. The large kimberlite pipes possibly trace the ancient magma feeders occurred in the time of the continent growth. Commonly kimberlites and large pipes are tracing the deep faults and lineaments tracing the ancient sutures, rift zones, trans -lithospheric faults and other permeable structures, which may be parallel to the ancient continental margins. Large pipes locate at the periodic distance like volcanoes in arc settings tracing the “volcanic fronts”. 2. Large pipes commonly contain the higher amounts of the sub-calcic garnets representing the dunitic associations (Stachel et al., 2008). In ophiolites dunites veins are representing the channels for the melt transfer (Kelemen et al., 2002). It is likely that ancient large magmatic arc system could have also deep seated roots represented by the (sub calcic) garnet - bearing dunitic systems. 3. Many large pipes including Udachnaya (Pokhilenko et al., 1999) and Mir (Roden et al., 2006) contain in mantle roots high amount of various pyroxenites. The most ancient pyroxenites are supplementary to the dunitic associations. But mostly they represent the materials from the re-melted eclogites and partial and hybrid melts (plume and subduction -related). They are concentrating in the traps in the lithosphere base, in the middle part of mantle section and in the basaltic trap 2.0-3.0 GPa. Pyroxenites in the lithosphere base in some cases are vary abundant but mostly they are protokimberlitic cumulates from of the latest stages of plume activity. Products of the melts crystallization from the earlier stages represent easy melting material at the lithosphere base could be the traps for the later plume melts. 5. Large pipes as a rule reveal contrast layering which is favorite for the capturing of the material from the walls. 6. Large productive pipes demonstrate abundance of the eclogites showing the signs of re-melting and formation of conduits for the rising melts 7. The temperature and pressure histograms for the xenocrysts and captured xenolith from the large diamondiferous pipes reveal the peaks in the High P -T conditions. Large pipes of low diamond grade demonstrate commonly complex magmatic history with the essential oxidation of melts in the latest stages.

In different terranes the structure of the lithosphere have individual features, In Magan terrane Mir and closely located pipes demonstrate very depleted high- pressure SCLM part and developed pyroxenite layer in MSCLM with the metasomatic upper part. .

In Daldyn terrane systematic differences in compositions of mantle pyropes and clinopyroxenes from large kimberlite pipes in the Alakit and Daldyn fields in Siberia suggest different geodynamic position. All pipes demonstrate good layering but the most productive pipes reveal more contrast SCLM structures. In the Alakit field, Cr-diopsides are much more alkaline and contain more sub-calcic pyropes and dunitic-type diamond inclusions like in Stykanskaya and some other pipes, while in the Daldyn field harzburgitic pyropes are frequent. The eclogitic diamond inclusions in the Alakit field are sharply divided in types and PT conditions, while in the Daldyn field they show varying compositions and often continuous PT ranges with increasing Fe# with decreasing pressures. In Markha terrane in Nakyn field the rhythmic layering beneath the Nyurbinskaya and Botuobinskaya pipes is accompanied by the abundance of the Al- rich eclogites with the domination of the Ca- rich types in the lower part of mantle section. In Upper Muna field the LSCLM part is abundant in the pyroxenite material in contrast to the other mantle segments of Siberian platform. The diamond grade in this part is lower but the quality of the diamonds is higher.

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