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Timing of the Siberian craton kimberlite magmatism: evidences from the U-Pb dating of kimberlitic zircon

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The Siberian Platform is a Paleoproterozoic collage of several Archean blocks which hosts approximately 1100 bodies located in 29 known fields of deep, mantle-derived, ultramafic alkali-rich and Si-poor magmatic rocks: kimberlites, carbonatites, melilitites, lamproites, lamprophyres and other varieties [1]. Twenty-two kimberlite fields in the central part of the Siberian craton are grouped into the Yakutian kimberlite province (YKP); the seven remaining fields tend to intrude along the periphery of the platform. Four fields along the eastern slope of the Anabar shield contain, beside kimberlites, significant populations of carbonatites, melilitites and picrites with increasing numbers towards the north.

At the present time, 7 epochs of kimberlite formation were recognized within the YKP: 450–430, 420–400, 380–350, 250–230, 170–150, 110–100, and 60–50 Ma [2-7]. However, most of the age determinations were performed using Rb-Sr method and thus potentially could be compromised due to severe secondary alteration of most pipes.

Here we report U-Pb ages of megacrystic zircons from 31 kimberlite pipes, sampled from 16 fields across the Yakutian kimberlite province. The new U-Pb ages, combined with previously reported geochronological age data, suggest that kimberlite intrusion occurred during four well defined episodes: Late Silurian - Early Devonian (419-407 Ma), Late Devonian - Early Carboniferous (370-344 Ma), Late Triassic (235-222 Ma), and Late Jurassic (160-150 Ma).

The barren kimberlites of the Chomurdakh, the West Ukukit, the East Ukukit, the Merchimden, and the Ogoner-Yuryakh fields intruded in the central part of the YKP during the Late Silurian - Early Devonian (419-407 Ma) episode.

The most of diamondiferous kimberlites and diamond mines of the Siberian craton belongs to the Late Devonian - Early Carboniferous (370-344 Ma) episode. During this episode kimberlites of the Mirny, the Nakyn, the Alakit-Markha, The Daldyn, and the Upper Muna fields intruded in the southern part of the Siberian craton.

The kimberlites intruded in the Late Triassic (235-222 Ma) and the Late Jurassic (160-150 Ma) episodes are overwhelmingly non-diamondiferous and situated in the northern part of the Siberian craton. The Kuranakh, the Kharamai, and the Luchakan fields belong to the Late Triassic episode. The Kuoika, the Birigindinskoe, and the Orto-Yarginskoe non-diamondiferous kimberlite and carbonatite fields belong to the Late Jurassic episode.

The spatial distribution of the kimberlites combined with the geochronological data indicate that there is no simple explanation or geodynamic model for their emplacement pattern on the Siberian craton.

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