Archean detrital zircon's age at the active East-volcanic zone of Kamchatka

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We present results of U-Pb isotopic and trace-element geochemical studies of detrital zircons collected in the area of Quaternary and the modern volcanic activity at the East-Volcanic Zone of the Kamchatka peninsula, Russia: Karymsky, Maly Semiachik, Central Semiachik, Uzon, Kihpinych and Krasheninnikov volcanoes located within the area of the Kronotsky National park. Pre-Quaternary volcanic or sedimentary rocks are not known in the area of sampling and there are no pre-Cretaceous rocks exposed in the Kamchatka peninsula.

The main goal of the study is to test a hypothesis of older basement rocks existence under the volcanoes in the melting area and to assess age of these source rocks. Recovered detrital zircons were studied by LA-ICP-MS technique using Element-XR ICP-MS and UP-213 laser ablation system.

Many of zircons were too young (much less than 1 Ma) to get quantitatively measurable U-Pb ages using LA-ICP-MS method, however a number of robust older age clusters were discovered. The most intriguing result is that more than a hundred zircon grains from three samples collected near the Karymskoe Lake produced a good discordia with ages 1940±50 Ma and 2980±20 Ma. Other less populated clusters are close to 330 Ma, 78 Ma and 2.4 Ma.

There is a correlation found between age and trace-element composition of the studied zircons: older zircons have higher Th/U ratios and more pronounced Eu anomaly than younger populations.

Obtained results reveal existence of the Achaean basement (ca 2980 Ma) under the East-Volcanic Zone of the Kamchatka peninsula as well as younger, particularly Cretaceous rocks that are known only within the Central Kamchatka Range.

Biogeochemistry of iron

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The first data about nonbarrier iron accumulation by external layers of trees trunks bark were received by us on fluorite-beryllium deposit in Zabaikalye. Detailed researches of chemical elements distribution in cross-sections of trees trunks and in their other parts and species of plants were conducted here for the first time, the aim of which was – the system of nonbarrier-barrier accumulation of plants in relation with beryllium and companions of its deposits. Here suddenly it was established that over fluorite-beryllium ore body the average content of iron for four specimen was anomaly high. In external layer of pine trunks bark it was 4, 1 %, in subereous cones and roots – 5 %. These contents in nonbarrier bioobjects of pine were higher than in soils (2 % in horizon A, 3 % - in B and 1 % – in C). For these nonbarrier bioobjects PSC of iron were unusually high 2-2, 5. According to A.I. Perel'man (1989) iron is referred to the elements of average and weak biological capture with the coefficients of biological absorption (CBA=PSC) 0, n – 0, 0n. Minimal content of iron at the considered key point of beryllium deposit – 0, 8 % was established in bast (cambiums) of pine with the contents in twigs, needles and green cones equal to1, 2; 2, 1 and 1, 4 %. For given four barrier bioobjects PSC were received equal to 0, 4; 0, 6; 1, 0; 0, 7 considering an average iron content in soil equal to 2 % – considerably less, than its clark, which was equal approximately to 5 %. Established high PSC of iron on beryllium deposit are connected with pyrite form of iron in fluorite-beryllium ores containing to 50-70 % of fluorite. On this beryllium deposit it was established that iron like Be, F, Li, Pb, Zr, Ti, Si, Al has the highest relative concentrations in external layers of trees trunks bark in comparison with other layers of bark, noticeably (in 2, 5 – 4 times) enriches the small fraction of crushed pine and larch bark and forms its own minerals in the bark: pyrite, magnetite (?) and ilmenite. These data were completely confirmed and supplemented when biogeochemistry of iron on its deposits in Angaro-Ilimskii ore region was researched.

Iron in cross-sections of larch, pine, birch, cedar, fir tree, rowan-tree trunks turned out to be distributed in the same type. For all studied species of trees the maximal contents of iron in external layer of bark, and minimal – in internal layer of the youngest bast cells consisting mainly of dividing cambial cells were established. For all species of trees in 1, 5-2 times greater content of iron is established in 'young' sap-wood in comparison with 'old' nucleous wood in the central part of trunk. 213 studied bioobjects of plants were grouped for the first time according to their prospecting informativeness to this chemical element.