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Late Paleozoic granitoid magmatism in Chukotka and its relation to Ellesmerian orogeny in Arctic Alaska and Canada

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Chukotka fold area (Mesozoides) was formed as a result of collision between Chukotka – Arctic Alaska microplate and active margin of Siberian continent [1]. At present the majority of researches distinguish at least three stages of granitoid magmatism of Chukotka Mesozoides: 147-139, 127-100 and 82.4-78.8 Ma [2]. Granites of first two stages intrude metamorphic basement and Paleozoic-Mesozoic fold structures. Formation of Early Cretaceous granitoids are often considered in relation to granite-metamorphic core complexes evolution [3-5]. Intrusion of the third stage granitoid intrusions corresponds to Okhotsk-Chukotka volcanic belt activity. At the same time in several publications there is information of existence of more ancient Paleozoic granitoids. For orthogneisses of East Chukotka there are age estimations 380-320 Ma (U-Pb SHRIMP, [6]). V.V.Akinin [7] showed that protoliths of Velinkenay and Kuekvun plutons have Late Devonian (380-360 Ma) age. Granites of Kibera Peninsula were dated as 439±32 Ma [Rb-Sr method, 8]. Besides basal conglomerates of Carboniferous deposits contain granite pebbles. At the same time on the existing geological maps granites are indicated as Early Cretaceous ones [9]. Thus there are contradictions on the age estimations and scales of Paleozoic and Mesozoic granitoid magmatism manifestation within Chukotka Mesozoides. As a result of this interregional correlations, first of all correlation of Caledonian and Ellesmerian orogenies events in Arctic region, are complicated. So we carried out U-Pb geochronological studies of some reference granitoid plutons of Central Chukotka, located in the cores of antiform structures, composed of Paleozoic deposits, namely granodiorites of Kibera and quartz syenites of Kuekvyun plutons (Kuul and Kuekvyun rises respectively).

Granitoids of Kibera pluton (coastal clippings of Kibera Peninsula, coast of East-Siberian Sea) intrude terrigenous Devonian deposits with carbonate units which are overlain with erosion by Permian-Triassic carbonate-terrigenous and sandy-argillaceous deposits. Kibera pluton is composed mainly of Amph-Bi granites and granite-porphyres. Endocontact zone is presented by foliated Bi granodiorites which were dated.

Within Kuekvyun Rise [2] in the core of lineated antiform structure Devonian deposits, metamorphosed to amphibolite facies and deformed, are exposed. Earlier such structures were considered as horst-like saliences of Paleozoic cover and crystalline basement, now, as structures of granite-metamorphic core complexes [3-5]. In the central part of antiform there are micaceous and Gar-Bi schists, marbled limestones, Q-Fsp-Ep-Bi-Amph, Bi-Amph-Cpx schists, intruded by subconcordant bodies of Amph-Bi quartz syenites. At the peripheral parts of rise metamorphic complexes are discordantly overlain by terrigenous deposits of Permian(?)-Triassic age.

Granodiorites of Kibera pluton (N 69°56' 50.5", E172°40' 52,1"; SiO_2=67.34%, TiO_2=0.41%, $Al2O_3$=14.72%, FeO=2.66%, $Fe2O_3$=1.88%, MnO=0.074%, MgO=1.4%, CaO=2.48%, Na2O=3.71%, K2O=3.42%, P2O5=0.232%) have foliated texture, blastogranitic structure and are composed of quartz, plagioclase, potassic feldspar and biotite. Accessory minerals are sphene, allanite, apatite and zircon.

Amph-Bi quartz syenites of Kuekvyun pluton (N 68°37'25.4", E178°28'21,2", SiO_2=63.51%, TiO_2=0.40%, $Al2O_3$=16.57%, FeO=2.3%, $Fe2O_3$=1.8%, MnO= 0.056%, MgO=0.99%, CaO=3.6%, Na2O=3.24%, K2O=5.83%, P2O5=0.245%) also have foliated texture, blastohypidiomorphic structure and are composed of plagioclase, potassic feldspar, amphibole, biotite and quartz. Sphene prevails within accessory minerals, allanite, apatite and zircon are also present.

U-Pb geochronological studies for Kibera granodiorite are carried out for three microshots (10-15 grains) of most transparent zircon crystals, selected from 85-100 and 100-150 micron fractions. Points of isotope composition of studied microshots form Discordia, which lower intersection with Concordia correspond to age 353±5 Ma (upper intersection, 1183±660 Ma, =0.17).

U-Pb geochronological studies for Kuekvyun quartz syenite are carried out for two microshots (13 and 15 grains)

of most idiomorphic and transparent zircon crystals, selected from 85-100 and >100 micron fractions. Points of isotope composition of these microshots are located on Concordia and zircon age, calculated in relation to 206Pb/238U is 352±6 Ma (MSWD=2.0).

Morphological peculiarities of studied zircons indicate their magmatic origin. This allows considering obtained age estimations as the age of their crystallization (353±5 and 352±6 Ma respectively).

As a result of carried out U-Pb geochronological studies the Early Carboniferous age of Kibera granodiorites and Kuekvyun quartz syenites was established. This fact confirms conception of Paleozoic granitoid magmatism manifestation within Central Chukotka. Magmatic events of this age are most likely related to Ellesmerian orogeny, distinctly expressed in the structures of Arctic Alaska and Canada.

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