Ketkap-Yuna igneous province gold mineralization age, ore-bearing complexes formation types, and different occurrence time of the late Mesozoic magmatism in different parts of the Aldan shield

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First $^{40}\text{Ar}/^{39}\text{Ar}$ isotopic age data for gold hydrothermal veinlet-vein mineralization of the late Mesozoic Ketkap-Yuna igneous province (KYuIP) of the Aldan shield (AS) confirm the geological relation of this type of mineralization with the early Cretaceous sub-alkali magmatism. The combination of geological characteristics and U-Pb dating of magmatites indirectly enabled us to determine the age and highly productive bi-metasomatic «massif-skarn» type of mineralization associated with sub-alkali magmatogenic formations of the province.

Isotopic datings of magmatites and gold mineralization of the KYuIP and other late Mesozoic igneous provinces of the Aldan shield show age conformity of ore-bearing magmatites and ores accompanying them (fig. 1, 2). A relative, in comparison to provinces of the tectonic-magmatic activation (TMA) of the Western and Central Aldan, delay in time of occurrences of the KYuIP late Mesozoic magmatism and gold mineralization related to it, and the difference in volume ratios of formational types of magmatic formations in different provinces can be explained by the characteristics of tectonic structure of the region.
We have distinguished two large areas of the late Mesozoic TMA of the AS differing in the timing of polyformational magmatism and concomitant mineralization of different types, and in dominating formational type of magmatites: Western–Central-Aldan on the one hand, and Eastern-Aldan on the other (fig. 1-3). The first is characterized by a long-term development of magmatic activity from the Berriasian to the early Albian (= 30 Ma), and prevalence of leucitite-alkali(foid)-syenite formation; the second is characterized by occurrences of magmatism in a period twice as smaller (= 15 Ma), and domination of subalkaline diorite-granodiorite-granite formation.
The termination of the late Mesozoic magmatism in both areas was sub synchronous. The “set” of magmatogenic formations within them is also similar: leucitite–alkali(foid)-syenite with alkali granites, monzonite(subalkaline shonkinite)-syenite and subalkaline diorite-granodiorite-granite. A typical feature of the Eastern-Aldan area of the TMA consists in Coniacian-Santonian burst of alkali volcanoplutonism, which manifested in the KYuIP after a long (about 30 Ma) period of magmatism.
Fig. 3. Summary thermochronological diagram for igneous rocks, ore and hydrothermal-metasomatic formations of the Late Mesozoic tectonic-magmatic activation of the Aldan shield stage (according to Fig. 1).

1-8 – isotopic dating: 1 – U-Pb monomineral (zircon, baddeleyite); 2 – Sm/Nd isochronous (full composition of rocks+minerals); 3-6 – $^{40}$Ar/$^{39}$Ar monomineral: 3 – for amphiboles, 4 – for micas, 5 – for feldspar, 6 – for rare charoitite minerals (toccoite, tixomite, frankamenite); 7 – $^{187}$Os/$^{188}$Os for platinum group minerals; 8 – Re/Os isochronous, for sulfides; 9 – graphs of the distribution of probability densities of ages: a) magmatites, b) ore formations, metasomatites and/or charoitites.

The Early Cretaceous "dating" of dunites, alkali-calcic clinopyroxenites, and platinum mineralization of the Konder (KYUIP) and Inagli (CAIP) masses is conditional, since, according to our ideas, they indicate not to the time of their primary crystallization, but to the post-crystallization transformations, i.e., the age of transformations which the late Riphean rocks and platinoid mineralization underwent during the period of Late Mesozoic magmatism of TMA. Zircons from dunites dated by the Neorarchean and the Paleoproterozoic ages must have been captured from crustal rocks. The Neoproterozoic (1000-950 Ma) age of the dunites, determined due to the usage of the paleomagnetic method seems to be the most valid (reasonable and justified).