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New Data on the Baraba Formation Age (the Sredinnyi Range of Kamchatka)

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Abstract—In the Sredinnyi Range of Kamchatka, the Baraba Formation of continental conglomerates is assumed to be of the late Campanian age based on found flora remains, but data of isotopic geochronology suggest the Eocene age of these deposits. New data on radiolarians from cherty pebbles are considered in this work along with results of fission-track dating of zircons from pebbles and matrix of the Baraba conglomerates. Fission-track dates obtained for zircons from matrix approve the Eocene age of the Baraba Formation, and new dates characterizing pebbles are not contradicting this conclusion. The Baraba Formation structural position can hardly be lower, therefore, than that of the Irunei Formation.

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Key words: Eocene, zircon, fission-track dating, radiolarians, Baraba Formation, Sredinnyi Range, Kamchatka.

INTRODUCTION

The Baraba Formation corresponding to a thick sequence of conglomerates, conglomeratic breccias and coarse-grained sandstones used to be regarded as an oldest stratigraphic subdivision containing clasts of metamorphic rocks of the Sredinnyi Range in Kamchatka. The formation age and its relations with unmetamorphosed rocks of the Upper Cretaceous have been topics of vivid discussions in the last 20 years (Shapiro et al., 1986; Zinkevich et al., 1994; Shapiro, 1994; Kolodyazhnyi et al., 1996; Slyadnev et al., 1997; Solov'ev et al., 2004; Shantser and Chelebaeva, 2004, 2005). Many researches are of opinion that the Baraba Formation is stumbling block in understanding the Cretaceous–Paleogene geological evolution of the Sredinnyi Range in Kamchatka. Geodynamic models of the range and the formation structural positioning are cardinally dependent of our viewpoints on the Baraba deposits. According to one standpoint based on determinations of fossil flora, the Baraba Formation is of the late Campanian age and represents basal unit of the Upper Cretaceous succession of unmetamorphosed deposits, which includes besides the Khozgon, Irunei and Kirganik formations of the Sredinnyi Range (Shantser and Chelebaeva, 2004, 2005). In this understanding, metamorphism in the Sredinnyi Range took place prior to the late Campanian. In the alternative opinion substantiated by U/Pb SHRIMP dating of zircons from tuffs in the succession basal interval, the Baraba Formation is of the early Eocene age and discordantly overlies metamorphic and unmetamorphosed rocks of the Upper Cretaceous (Solov'ev et al., 2004). In distinction from the above standpoint, this approach is consistent with new data implying Cretaceous and Paleocene ages of protoliths for the Kolpakova and Kamchatka groups, respectively, and the early Eocene age of metamorphic events in the range (Hourigan et al., 2004; Solov'ev, 2005). New data supporting indirectly the last viewpoint, i.e., identification of radiolarians from pebbles and fission-track dating results for zircons from pebbles and matrix of the Baraba Formation conglomerates, are considered in this work.

STRUCTURAL POSITION OF THE BARABA FORMATION

It is unnecessary to repeat well-known descriptions of the Baraba Formation (Shapiro et al., 1986; Slyadnev et al., 1997; Shantser and Chelebaeva, 2004, 2005). The only point that should be stressed is different understanding of the formation range and distribution. The formation stratotype is established in outcrops of the Mt. Baraba and northwestward (Khimka River basin) to southward (Oblukovina River right bank) off this site (Fig. 1). Besides, some researchers regard conglomerates of the Oblukovina River left side as constituents of the formation (Shantser and Chelebaeva, 2004, 2005; Solov'ev et al., 2004), whereas I.A. Sidorchuk and his followers (*Map of Mineral…*, 1999) attribute these conglomerates to the Khulgun Formation exposed in small areas further westward, in the Platonich and Tyum-

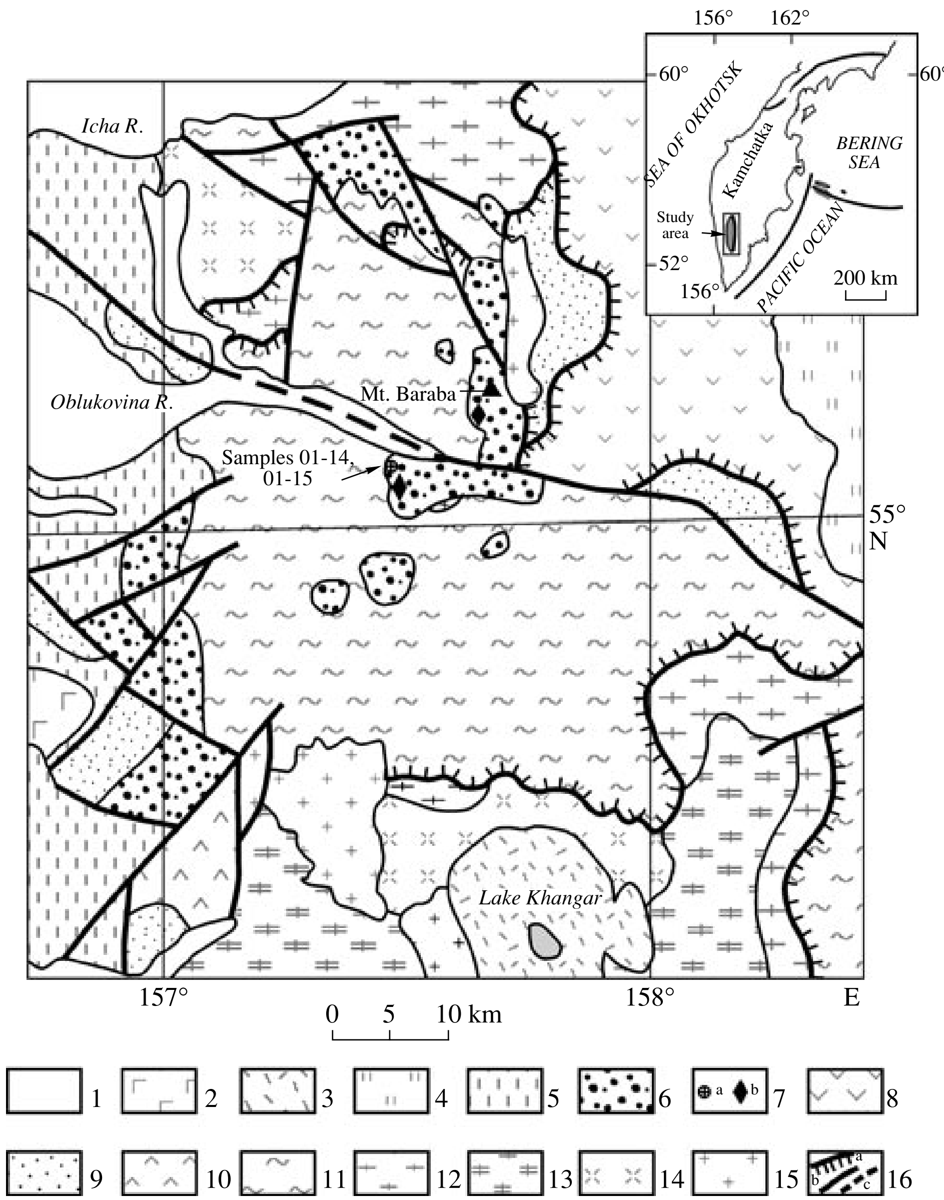

Fig. 1. Geological scheme of the northern Malka Uplift (simplified after *Map of Mineral…*, 1999): (1) Quaternary sediments, (2) basalts and (3) rhyolites; (4) Miocene–Pliocene volcanics; (5) middle Eocene–Miocene marine sediments; (6) conglomerates, Baraba and Khulgun formations; (7) sampling sites for fission-track dating (a) and radiolarian analysis (b); (8) Irunei Formation, Campanian–Maastrichtian; (9) Khozgon Formation, Upper Cretaceous–lower Paleocene; (10) Kvakhon Formation, Jurassic–Lower Cretaceous?; (11–13) metamorphic rocks of the Malka (11), Kamchatka (12) and Kolpakova (13) groups; (14) Late Cretaceous granites of the Krutogorova Complex; (15) Cenozoic granitoids; (16) thrust (a) and other established (b) or presumable (c) faults.

shech riverheads (Fig. 1). The last last viewpoint on conglomerates, which rest on metamorphic rocks and are composed mostly of clasts deriver from the latter, appears to be artificial, because their outcrops are known within a compact northwestern region of the Malka Uplift (Fig. 1), being practically absent elsewhere in the southern Sredinnyi Range. A distinction of rocks at the Mt. Baraba site from those attributed to the Khulgun Formation is determined by contact metamorphism. Being slightly transformed into hornfels, the rocks of stratotype are more resistant to weathering and denudation. They are ideally exposed in contrast to fragmentary outcrops of the Khulgun Formation and suitable for comprehensive examination. Fossil flora collected at the Mt. Baraba site is more abundant and diverse than elsewhere, corresponding in age to the late Campanian in opinion of Shantser and Chelebaeva (2005).

Almost all geologists who studied the Mt. Baraba site describe a sharp discordance that separates deposits of the Baraba Formation from underlying metamorphic rocks of the Malka Group: quartz-chlorite-sericite schists and quartzites of the Khimka Formation, phyllites and metasandstones of the Kheivan Formation (*Geology of the USSR…*, 1964; Shapiro et al., 1986; Zinkevich et al., 1994; Shantser and Chelebaeva, 2004, 2005). The alternative opinion that boundary between the Baraba conglomerates and underlying rocks is tectonic, corresponding to a thrust fault (Slyadnev et al., 1997), is hardly plausible. Clasts in conglomerates and breccias represent mostly the underlying rocks of the Kheivan and Khimka formations, and stratigraphic discordance between the Baraba Formation and Malka Group of metamorphic rocks is doubtless.

In the Khimka riverhead, I.A. Sidorchuk and E.M. Ereshko discovered small lenses (a few to tens meters thick) of cherty-clayey rocks, which are structurally below conglomerates of the Baraba Formation and separate them from metamorphic rocks of the Khimka Formation. These rocks yield the Campanian–Maastrichtian radiolarians and contain clasts of inoceramid prismatic layers, which are typical of the Irunei Formation (Shapiro et al., 1986). Lower contacts of these lenses are diversely interpreted as discordant (Sidorchuk), metamorphic (Ereshko), or tectonic (Shapiro et al., 1986). Upper contacts are stratigraphic though either conformable (Sidorchuk) or discordant (Shapiro et al., 1986) as they are described. A section (10 m thick) of unmetamorphosed siliceous tuffs of the Irunei Formation is described on the right side of the Kapitanskaya River 1.5 km upstream of its mouth (Solov'ev et al., 2004), where the tuffs occur below the Baraba conglomerates but above chlorite schists and phyllites of the Kheivan Formation. As the Irunei Formation lenses occur below the Baraba Formation, stratigraphic column published by Shantser and Chelebaeva (2005, Fig. 1.7) seems doubtful. Moreover, the map reproduced in the same work (Fig. 1.2) shows chert lenses dipping under the Baraba conglomerates and containing fragmented prismatic layers of inoceramids that is typical of the Irunei Formation. However, Shantser and Chelebaeva (2005) are of opinion that "these cherty siltstones have nothing in common with the Irunei Formation of the study area" (p. 14) and exclude them from stratigraphic succession (Fig. 1.7). Their opinion is not convincing however.

Rocks of the Malka Group are exposed along periphery of the Khangar dome composed in its core of gneisses of the Kolpakova and Kamchatka groups. In most regional maps, the gneisses are attributed to the Proterozoic–Lower Paleozoic, and the Malka Group corresponds to the Middle–Upper Paleozoic (*Map of Mineral…*, 1999). Living aside principles used by the map compilation, we should state only that any age range of the Baraba Formation corresponding either to the Eocene or the Campanian is consistent with the map legend. However, the U–Pb (SHRIMP) dating of zircon and monazite showed that rocks of the Kolpakova and Kamchatka groups of the Sredinnyi Range originated in the early Eocene, when metamorphism affected the Upper Cretaceous and Paleocene terrigenous rocks analogous in composition and age to terrigenous complexes of West Kamchatka (Hourigan et al., 2001, 2004; Solov'ev, 2005). According to protolith age, lower metavolcanics of the Malka Group (Andrianovka Formation) turned out to be probable analogues of the Irunei Formation (Solov'ev and Palechek, 2004). The main volume of metamorphic rocks originated in the Sredinnyi Range most likely during the early Eocene in the course of regional thrusting of Cretaceous island-arc sequences over the Upper Cretaceous and lower Eocene terrigenous sediments of the Asia continental margin (Solov'ev, 2005). The allochthonous complex of intricate structure included most likely the metamorphosed island-arc rocks (Andrianovka and Khimka formations) and their unmetamorphosed equivalents, the rocks of the Irunei Formation. Accumulation of the Baraba Formation corresponding to the neoautochthon base should be antedated by a combined deformation of allochthonous and autochthonous complexes with subsequent exhumation of resultant metamorphic rocks to the level of unmetamorphosed analogues. This scenario explains geological position of small blocks of the Irunei Formation under the Baraba conglomerates in the Khimka River basin and the Kapitanskaya River right side (Fig. 1) and occurrence of this formation larger blocks amidst metamorphic rocks of the Malka Group in the Krutogorova and Kvakhona river basins. Pebbles of unmetamorphosed cherts occurring sporadically in the Baraba conglomerates could be derived from blocks of this kind.

RADIOLARIANS FROM PEBBLES OF THE BARABA FORMATION

Pebbles of cherty rocks have been collected from conglomerates at the Mt. Baraba southeastern slope. Radiolarians macerated from the samples are in satisfactory preservation state (Table 1), divisible in two assemblages indicative of the Santonian–Campanian (samples Bmt 1/9, Bmt 1/25, Bmt 1/28, Bmt 1/29) and Albian–Cenomanian (Sample Bmt 1/55) ages of their host rocks.

Santonian–Campanian radiolarians macerated from pebbles of Baraba conglomerates are well correlative with radiolarian assemblages from the Irunei Formation of the Sredinnyi Range (Vishnevskaya, 2001; Solov'ev and Palechek, 2004). They can be correlated as well with the middle Campanian radiolarian assemblage identified by Vishnevskaya (2001) in cherts of the Khozgon Formation (samples 90/83 and 8317/9 from collections of Yu.N. Raznitsyn and M.N. Shapiro, Oblukovina River basin, Sredinnyi Range). The last assemblage consists of well-preserved and diverse radiolarians from different morphological groups. Radiolarian assemblages from the sampled pebble of the Baraba Formation and from cherts of the Khozgon Formation are very similar in taxonomic composition and include the following species in common: *Praestylosphaera pusilla, Lithostrobus rostovzevi, Amphipyndax*

Table 1. Radiolarians from cherty pebbles of the Baraba conglomerates

Sample no.	Radiolarian species	Age							
		K1				K2			
		apt	alb	cen	tur	con	san	cmp	m
Bmt 1/9	*Patulibracchium* cf. *petroleumensis* Pessagno								
	Crucella cf. *aster* (Lipman)								
	Alievium sp.								
	Stichomitra sp.								
	Amphipyndax sp.								
	Dictyomitra sp.								
Bmt 1/25	*Orbiculiforma* cf. *quadrata* Pessagno								
	Praestylosphaera cf. *hastata* (Campbell et Clark)								
	Lithostrobus cf. *rostovzevi* Lipman								
	Patulibracchium cf. *petroleumensis* Pessagno								
	Archaeodictyomitra cf. *squinaboli* Pessagno								
	Dictyomitra cf. *formosa* Squinabol								
	Dictyomitra cf. *multicostata* Zittel								
	Amphipyndax cf. *stocki* (Campbell et Clark)								
	Xitus cf. *asymbatos* (Foreman)								
	Paronaella sp.								
	Alievium sp.								
Bmt 1/28	*Patulibracchium* cf. *petroleumensis* Pessagno								
	Praestylosphaera cf. *pusilla* (Campbell et Clark)								
	Theocampe cf. *altamontensis* (Campbell et Clark)								
	Amphiphyndax cf. *stocki* (Campbell et Clark)								
	Lithostrobus cf. *rostovzevi* Lipman								
	Dictyomitra sp.								
	Alievium sp.								
	Paronaella sp.								
	Crucella sp.								
Bmt 1/29	*Crucella* cf. *aster* (Lipman)								
	Histiastrum cf. *latum* Lipman								
	Patulibracchium cf. *petroleumensis* Pessagno								
	Alievium cf. *gallowayi* (White)								
	Dictyomitra cf. *densicostata* Pessagno								
	Amphipyndax cf. *stocki* (Campbell et Clark)								
	Stichomitra sp.								
	Theocampe sp.								
Bmt 1/55	*Alievium* cf. *antiguum* Pessagno								
	Squinabollum ex gr. *fossile* (Squinabol)								
	Histiastrum cf. *latum* Lipman				?				
	Thanarla sp.								
	Dictyomitra sp.								
	Paronaella sp.								
	Orbiculiforma sp.								

Note: Shaded columns denote ages of radiolarian assemblages; (apt) Aptian, (alb) Albian, (cen) Cenomanian, (tur) Turonian, (con) Coniacian, (san) Santonian, (cmp) Campanian, (m) Maastrichtian.

stocki, Dictyomitra multicostata, and *Xitus asymbatos* (Table 1). The listed species occur in the Santonian–Campanian deposits of the Olyutor zone, Koryak Upland (Palechek, 1997; Vishnevskaya, 2001), and in the Santonian–lower Campanian sediments of the Ust-Palana area (Vishnevskaya et al., 2003), Rassoshina and Tikhaya rivers, at the Mt. Irunei of West Kamchatka (Kurilov et al., 2002; Vishnevskaya et al., 2005). In Campanian deposits of East Kamchatka (Zinkevich et al., 1984), there are only cosmopolitan species in common: *Amphipyndax stocki, Dictyomitra densicostata, D. multicostata, Xitus asymbatos* and some others.

Many radiolarian species identified in cherty pebbles are known from the late Senonian deposits of California (Campbell and Clark, 1944; Pessagno, 1976). Species *Lithostrobus rostovzevi, Crucella aster*, and *Histiastrum latum* have been described from Upper Cretaceous sediments of West Siberian lowland (Lipman, 1962). Being compared with Santonian–Campanian radiolarian assemblages of the Naiba section in western Sakhalin (Kazintseva, 2000), radiolarians identified in this work can be placed at the level of *Archaeospongoprunum bipartitum–Patulibracchium petroleumensis* and *Spongostaurus (?) hokkaidoensis–Hexacontium* sp. assemblages from members 9 and 10, respectively, of the Bykovo Formation. Species *Orbiculiforma quadrata, Dictyomitra formosa*, and *Praestylosphaera pusilla* have been reported from the Coniacian–lower Campanian deposits of Hokkaido (Taketani, 1982).

Albian–Cenomanian radiolarians are satisfactory preserved in one collected pebble (Sample Bmt 1/55). Their assemblage includes species mentioned below. *Alievium* cf. *antiguum* Pessagno is known (Pessagno, 1971) from the upper Aptian of Bahama Basin (JOIDES Leg l, Site 5a, section 1, Core Catcher Blake Bahama Basin). Species *Squinabollum* ex gr. *fossile* (Squinabol) described from Albian–Turonian sediments in Italy (Squinabol, 1903) is also known from the Albian–Turonian of the Greater Caucasus (Kazintseva, Plate XXXIX, *Practical Guide*..., 1999), the upper Albian–Cenomanian of Kamchatka (Vishnevskaya, Plate XXXVIII, *Practical Guide*..., 1999), Carpathian Mountains of Romania and Sakhalin, the upper Albian–Turonian of Iran, and upper Albian–lower Coniacian of Japan. *Histiastrum* cf. *latum* Lipman, the form described from the Santonian–Campanian strata of West Siberia and Eginsai Formation of Turgai depression (Lipman, 1962) is characteristic of the upper Albian in western Sakhalin (Naiba section) and Crimea (Kazintseva, plates XXXV and XXXVII, *Practical Guide*..., 1999). The other species identified in our assemblage are *Orbiculiforma* sp., *Paronaella* sp., *Thanarla* sp., and *Dictyomitra* sp.

Albian–Cenomanian (Aptian–Cenomanian in other interpretation) radiolarians are known in the East Kamchatka as well. They occur in southern areas of the Kamchatskii Cape (Vishnevskaya, 2001), Ozernoi Peninsula (Zinkevich et al., 1984), northern Kumroch Range (Tsukanov, 1985), and Karaginskii Island (Bragin et al., 1986). Albian Radiolarians have been found as well in the Olyutorskii Peninsula, the Koryak Upland (Bogdanov et al., 1987).

Macrofossils of the Albian are known in West Kamchatka from terrigenous deposits of the Omgon Group in the eponymous peninsula (*Geology of the USSR*..., 1964), from the Mametcha Formation of the Penzhina area (Kazintseva, 1979), and from the Tal'nicha Formation (R. Novakov, personal communication, Petropavlovsk-Kamchatskii). Mollusks of the lower Albian have been described in the Cape Khairyuzova, West Kamchatka (Palechek et al., 2005). An assemblage of redeposited Albian–Cenomanian radiolarians has been detected in a block of cherty rocks 1.5 km to the north from the Anadyrka River mouth (Kurilov, 2000).

Thus, cherty pebbles of the Baraba conglomerates were derived from a provenance, where Santonian–Campanian cherty rocks, analogues of the Irunei Formation in the Sredinnyi Range eastern flank and West Kamchatka, were exposed and subjected to erosion in addition to metamorphic rocks of the Malka Group. Pebbles of the Albian–Cenomanian cherts are less

Table 2. Fission-track ages of detrital zircons from matrix of the Baraba conglomerates

Sample no.	Formation	Nt	Age of zircon populations, Ma		
			P1	P2	P3
01-14	Baraba	40	40.0 ± 4.0 (15.8%)	63.0 ± 3.7 (60.9%)	128.8 ± 10.5 (23.3%)

Note: (P1, P2, P3) Ages of zircon populations (Ma, uncertainty ±1σ) estimated using program BinomFit v. 1.8 (Brandon, 2002) and percentages of grains in the given population relative to total amount of dated grains (Nt). The dating method with external detector is as described earlier (Wagner and Van den Haute, 1992; Garver et al., 1999). Being mounted in two FEP Teflon[MT] plates, grains were polished using diamond paste (9 and 1 μm) and Al_2O_3 paste (0.3 μm) at the final stage to be etched afterward in NaOH–KOH solution under temperature 228°C during 18 (first plate) and 28 (second plate) hours. After etching, plates covered by detector (low-U mica) were irradiated by thermal neutron flux ($\sim 2 \times 10^{15}$ neutron/cm^2, reactor at the University of Oregon) simultaneously with zircon standards Fish Canyon Tuff (FCT), Buluk Tuff (BL) and glass-dosimeter CN-5 with known U concentration (Hurford, 1998). Tracks are counted under microscope Olympus BX60 with automated system and digitizer tablet, maximum magnification 1250, dry method. Z-factor calculated for 15 analytical runs (FCT, BL) was 329.8 ± 4.56 (Hurford, 1998).

frequent, and relevant radiolarians either characterize age of the lower Irunei horizons or are redeposited.

FISSION-TRACK DATING OF ZIRCONS FROM MATRIX AND PEBBLES OF THE BARABA CONGLOMERATES

As rocks of the Mt. Baraba stratotype area experienced thermal impact (contact metamorphism), we collected samples appropriate for fission-track dating of zircons outside this area on the Oblukovina River right bank 1.5 km upstream of the Kapitanskaya River mouth. Matrix of conglomerates is represented here by fine- to coarse-grained lithified sandy material with lustrous coal clasts. Rocks occurring in pebbles are phyric volcanics, cherts, granites, sandstones and phyllites. Pebbles and boulders are unsorted. We collected one sample of matrix (no. 01-14) and an ellipsoidal granite pebble (no. 01-15). Zircon grains are separated by standard method at the Laboratory of Fission-Track Dating of Geological Institute, Russian Academy of Sciences. The applied procedure of fission-track dating is that described by Wagner and Van den Haute (1992).

Zircons of variable age from sandstone (01-14) matrix (Table 2, Fig. 2) represent three populations P1 (40.0 ± 4.0 Ma), P2 (63.0 ± 3.7 Ma) and P3 (128.8 ± 10.5 Ma). Estimated ages characterize cooling time of zircons in provenance, and the youngest population is close in age to sedimentation time (Garver et al., 2000; Solov'ev, 2005). Since terrigenous deposits must be younger than clastic zircons they contain, the Baraba conglomerates of the Kapitanskaya River area accumulated not earlier than in the middle Eocene. The youngest population of zircons is likely interrelated in origin with a volcanic event concurrent to sedimentation.

In collected pebble of amphibole-biotite granite (Sample 01-15), plagioclase is represented by subidiomorphic zonal crystals with chlorite-epidote pseudomorphs after small resorbed labradorite cores. Outer andesine-albite zones are replaced by sericite to a minor extent. Grains of quartz and K-feldspar are xenomorphic. Dark minerals are amphibole (presumably hornblende) and biotite of two high- and low-temperature generations displaying pleochroism from dark brown and green to yellow colors, respectively. Amphibole and high-T biotite contain small poikilitic inclusions of plagioclase and ore mineral. Both biotite generations are replaced in part or completely sometimes by alkalic chlorite ± ore mineral; poikilitic plagioclase inclusions by epidote. Dark minerals and plagioclase are more idiomorphic than quartz and K-feldspar. The rock is of allotriomorphic-granular texture. Accessory phases are apatite, zircon, and subidiomorphic grains of ore mineral.

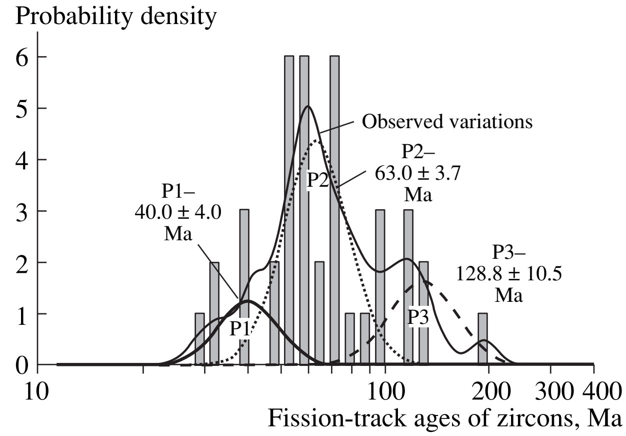

Fig. 2. Fission-track ages of zircon grains from matrix of the Baraba conglomerates (Sample 01-14); peaks of zircon populations P1, P2 and P3 (see Table 2) are detected by program BinomFit v. 1.8 (Brandon, 2002).

Zircons separated from granite pebble are dated at 83.3 ± 4.3 Ma (Table 3). The dates corresponds to time of granite cooling below the closure temperature of fission-track system in zircon crystals (215–240°C after Brandon and Vance, 1992) that took place in the Campanian. Pebbles of this kind are likely derived from granites of the Campanian Krutogorova Complex (Hourigan et al., 2004).

Table 3. Fission-track dating of zircons from granite pebble of the Baraba conglomerate

Formation	Rock, Sample no.	ρs	Ns	ρi	Ni	ρd	Nd	*n*	χ^2	Age	−1σ	+1σ	U ± 2 se
Baraba	Granite (pebble), 01-15	7.67	1521	4.33	860	2.876	1690	15	1.7	83.3	−4.1	+4.3	185.4 ± 15.1

Note: (ρs) density of ^{238}U spontaneous fission tracks (cm^{-2} × 10^6); (Ns) number of counted spontaneous fission tracks; (ρi) density of ^{238}U induced fission tracks (cm^{-2} × 10^6); (Ni) number of counted induced fission tracks; (ρd) density of tracks in external detector (low-U mica) (cm^{-2} × 10^5); (Nd) number of tracks counted in external detector (low-U mica); *n*—number of grains counted. (χ^2) xi-squared probability, %; (±1σ) estimated age uncertainty; pooled age is presented. Z-factor calculated for 15 analytical runs (FCT, BL) was 329.8 ± 4.56 (±1 se). Samples were irradiated by thermal neutron flux (~2 × 10^{15} neutron/cm^2, reactor at the University of Oregon) simultaneously with FCT and BL zircon standards, and glass-dosimeter CN-5 with known U concentration. Tracks are counted under microscope Olympus BX60 with automated system and digitizer tablet, maximum magnification 1250, dry method. U concentration is given in ppm.

CONCLUSIONS

(1) Fission-track dating of zircons from matrix of conglomerates exposed in the Kapitanskaya River valley shows that sediments of the Baraba Formation accumulated since the middle Eocene, not earlier.

(2) Cherty pebbles from the Baraba conglomerates yield radiolarian assemblages of the Albian–Cenomanian and Santonian–Campanian. Pebbles of conglomerates are derived probably from tectonic blocks of the Irunei Formation, which had been juxtaposed with metamorphic rocks of the Malka Group, when the Late Cretaceous island arc was obducted onto continental margin of Asia. It is doubtful that structural position of the Baraba Formation is lower than that of the Irunei Formation, because conglomerates contain pebbles of the Santonian–Campanian rocks.

(3) During the accumulation period of the Baraba Formation, granitoids of the Krutogorova Complex were at the erosion level, in part at least.

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Reviewer N.Yu. Bragin

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