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UPPER PLIOCENE AND PLEISTOCENE OF THE SOUTHERN URALS REGION

AND ITS SIGNIFICANCE FOR CORRELATION OF THE EASTERN AND WESTERN PARTS OF EUROPE

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SMALL MAMMALS OF THE MIDDLE PLIOCENE OF THE RUSSIAN PLAIN

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The material on small mammals accumulated in the last years allows one to distinguish in the time sequence of the Pliocene communities from the Russian Plain a separate faunal association named the Uryv Assemblage. This is especially topical with regard to the description of Gelasian marine deposits and introduction of the Middle Pliocene Substage in the stratigraphic chart. Factual data give evidence for a substantial evolutionary gap between mammals of the Khaprovian and Moldavian faunal assemblages. This suggests the absence of a considerable time stage corresponding to the Middle Pliocene in the biostratigraphic chart.

The mammal faunas that are more primitive than the Khaprovian Fauna and more advanced than the Moldavian Fauna are known from the basin of the Upper Don and Volga. They come from the alluvial formations corresponding to the Gauss paleomagnetical epoch and the early half of the Matuyama reversed epoch and dated to the middle and first half the upper part of the Pliocene. It is proposed to designate the faunas of this time as the Uryv Assemblage. The bone horizon of the Uryv–1 locality is in a rather complete section, which was studied in detail. In several kilometres from this point, there is the Korotoyak Section containing faunas of similar composition. This allows one to characterise the main developmental stage of the Uryv Fauna, to outline its early and late phases, and reveal the relationships with the previous Moldavian Assemblage and the subsequent Khaprovian Assemblage.

The Uryv Fauna is dominated by rhizodont voles of the *Promimomys–Mimomys* group; lagomorphs are abundant; voles of the genus *Pliomys*, group *P. ucrainicus*, are present; the genus *Dolomys* is absent or extremely scarce; primitive voles of the genus *Villanyia* (e.g., *V. exilis*) are present, occasionally, they are rather common; the vole-like rodent *Baranomys* is present but scarce; and the primitive vole *Stachomys* is recorded. The characteristic elements of various stages of the Uryv Fauna are *Promimomys gracilis* Kretzoi, *Promimomys baschkirica* Suchov, *Mimomys hajnackensis* Fejfar, and *Mimomys polonicus* Kowalski. Archaic shrews of the genera Blarinoides, Beremendia, and Drepanosorex and small desmans of the genus Desmana represent insectivores.

The communities the Uryv Assemblage form a clear sequence, which reflects the stages of the faunal development. The earliest association is known from the Korotoyak–1 locality; it was distinguished by a high proportion of lagomorphs (about 20%) and a greater proportion of the voles *Promimomys* as were compared to *Mimomys*. The low-cemented forms mainly represent *Mimomys*. The proportion of *Pliomys* reaches 8%. The advanced faunas from the Uryv–1 and Korotoyak–2 localities include a smaller proportion of lagomorphs; equal numbers of *Promimomys* and *Mimomys*; and a greater specialisation of members of the latter genus. The proportion of *Pliomys* is at most 4%. Both early and advanced faunas include the vole *Mimomys hajnackensis*. The late Uryv faunas from the Uryv–2 and Korotoyak–3 localities are distinguished by the prevalence of voles of the genus *Mimomys* and a decrease in the proportion of lagomorphs down to 3–4%. Voles of the genus *Mimomys* become more advanced and increase in species diversity. *Mimomys polonicus* is a common species of these communities.

With reference to the Land Mammal Ages the Uryv Assemblage fits into the early half of the Villanyan, i.e., the Lower Villafranchian. The early and advanced communities are dated as Subzone MN16a; and the late communities, as Subzone MN16b.

This study was supported by a research grant from the Russian Science Foundation for Basic Research (№ 02–04–48458).

Table. The position of mammal assemblages of the Uryvian in the sequence of the Pliocene and Pleistocene small mammal assemblages from the Russian Plain

SYSTE	EPOCH		Stage	TIME MA	AGE	POLARITY	EPISOD	CHRONS	Stage	Mamm. zones	Mammalian stage		Locality in Don & Dnepr basin	Small mammals
									The Russian Plain					
QUATERNARY	PLEISTOCENE	u.		0				BRUNHES		MQ21	Khvalynian		Mikhailovka-5	*Arvicola* cf. *sapidus*, *Microtus arvalis*
		middle	Emilian								Khazarian		Topka	*Arvicola chosaricus*
											Singilian		Vladimirovka, Strelitsa	*Arvicola mosbachensis*, *Lagurus transiens*, *Microtus malei*
				0,5	0,78					MQ20	Tiraspolian		Kuznetsovka (+) Novokhopersk Veret'e (+), Il'inka (+)	*Mimomys intermedius*, *Lagurus posterius*, *Terricola gregaloides* *Mimomys intermedius*, *Mimomys pusillus*, *Microtus oeconomus*, *Terricola hintonilei*
		lower	Calabrian	1			Kz J	MATUYAMA	Apsheronian	MQ19	Tamanian		Moiseevo-1 (+) Log Krasnyi (-) Korotoyak-3c (+) Korotoyak-3b (-)	*Allophaiomys pliocaenicus*, *Prolagurus pannonicus*, *Mimomys pusillus*
				1,5	1,79		K-M			MQ18	Odessian		Korotoyak-3a (-), Uspenka, Log Denisov Strelitsa-1 (-) Mikhailovka-1	*Allophaiomys pliocaenicus*, *Prolagurus praepannonicus*, *Mimomys pusillus* *Mimomys savini*, *Mimomys pliocaenicus*, *Allophaiomys pliocaenicus*, *Clethrionomys*
NEOGENE	PLIOCENE	upper	Gelasian	2			O R		Akchagylian	MN17	Khaprovian		Liventsovka 4-5 (-) Liventsovka 1-3 (-) Krivski (-)	*Mimomys pliocaenicus*
				2,5	2,59					MN16b	Uryvian	late	Korotoyak-2a (-) Uryv-2 (-)	*Promimomys baschkirica*, *Mimomys polonicus*, *Mimomys pliocaenicus minor*, *Stachomys igrom*
		middle	Piacenzian	3			K	GAUSS				advanced	Uryv-1, Korotoyak-2 (+)	*Mimomys hajnackensis*, *Villanyia petenyii*, *Nannospalax odessanus*
				3,5	3,58		M			MN16a		early	Korotoyak-1(-)	*Pliomys ucrainicus topacevski*, *Promimomys gracilis*, *Mimomys* ex gr. *hajnackensis*
		lower	Zanclean	4				GILBERT	Kimmerian	MN15	Moldavian		Korotoyak-Don (-) Gerasimovka	*Dolomys nehringi*, *Pliomys jalpugensis*, *Promimomys moldavicus*
				4,5			Co Nv			MN14	Kuchurganian		Antipovka (-), Chugunovka	*Pliopetaurista*, *Epimeriones*, *Polonomys insuliferus*, *Nannospalax macoveii*, *Trogontherium* ex gr. *minus*
				5			Sd Tv			MN13				

(+) normal polarity
(-) reversed polarity

SMALL MAMMALS FROM THE APASTOVO LOCALITY

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The earliest mammal faunas in the Russian Platform are known from the Early and Middle Pliocene of the Upper Don and Bashkortostan. They allow one to correlate the continental beds of that time with the European stratigraphic scale. The large distance between these regions complicates their direct comparison. Therefore, by so important the discovery of the Middle Pliocene localities on the left bank of the Volga and the Kama Region was important to fill a spatial gap between the Don basin and Bashkortostan.

An especially important Pliocene section is located on the watershed surface on the right slope of the Sviyaga River valley near the town of Apastovo (Tatarstan). The upper part of the section is exposed in the keramzite clays quarry. The exposure is about 200 m of total extent and about 20 m deep and more. The strata are inclined from the south-east (from the watershed) to the north-west (to the Sviyaga valley). Just below the Late Pleistocene loesses, there are the Pliocene subaquatic deposits. The bones of small mammals come from the sands of layer 4, which are assigned to the Kumurly Horizon (see figure). They with erosion overlay the main strata of dense grey clays, the facial pattern of which varies vertically. These lacustrine clays are assigned to the Karlaman or Tchebenka horizons. According to Yakchemovich *et al*. (1997), the Kumurly Sands of the Apastovo section are characterised by direct magnetisation with an interval of reverse magnetisation in the lower part of the layer.

The taxonomic composition of the bone horizon of the Apastovo locality is as follows:

Insectivora: *Desmana* sp., 11 (2.4%); *Talpa* ex gr. *minor,* 2 (0.4%); *Blarinoides* sp., 4 (0.8%); Lagomorpha: *Ochotona* sp., 3 (0.6%); *Pliolagus brachignatus,* 64 (14.0%); Rodentia: *Tamias orlovi,* 3 (0.6%); *Villanyia veterior,* 7 (1.5%); *Promimomys* (*Cseria*) *baschkirica,* 26 (5.6%); *Promimomys* sp., 23 (5.0%); *Mimomys* cf. *hintoni,* 20 (4.3%); *Mimomys* ex gr. *hajnackensis,* 25 (5.4%); *Promimomys–Mimomys,* 250 (54.7%); Lemmini gen., 2 (0.4%); *Prosiphnaeus* sp., 15 (3.2%); Castoridae gen., 2 (0.4%). Total, 457 specimens (100%)

As follows from the above list, a substantial part in the faunal composition has played by insectivores (3.8%): a large Pliocene shrew, mole, and desman. The hare is abundant (14.25%); beaver and a rhizodont zokor are present. The rhizodont voles (78.2%) are abundant. The general ecological composition suggests favourable climatic conditions of that time.

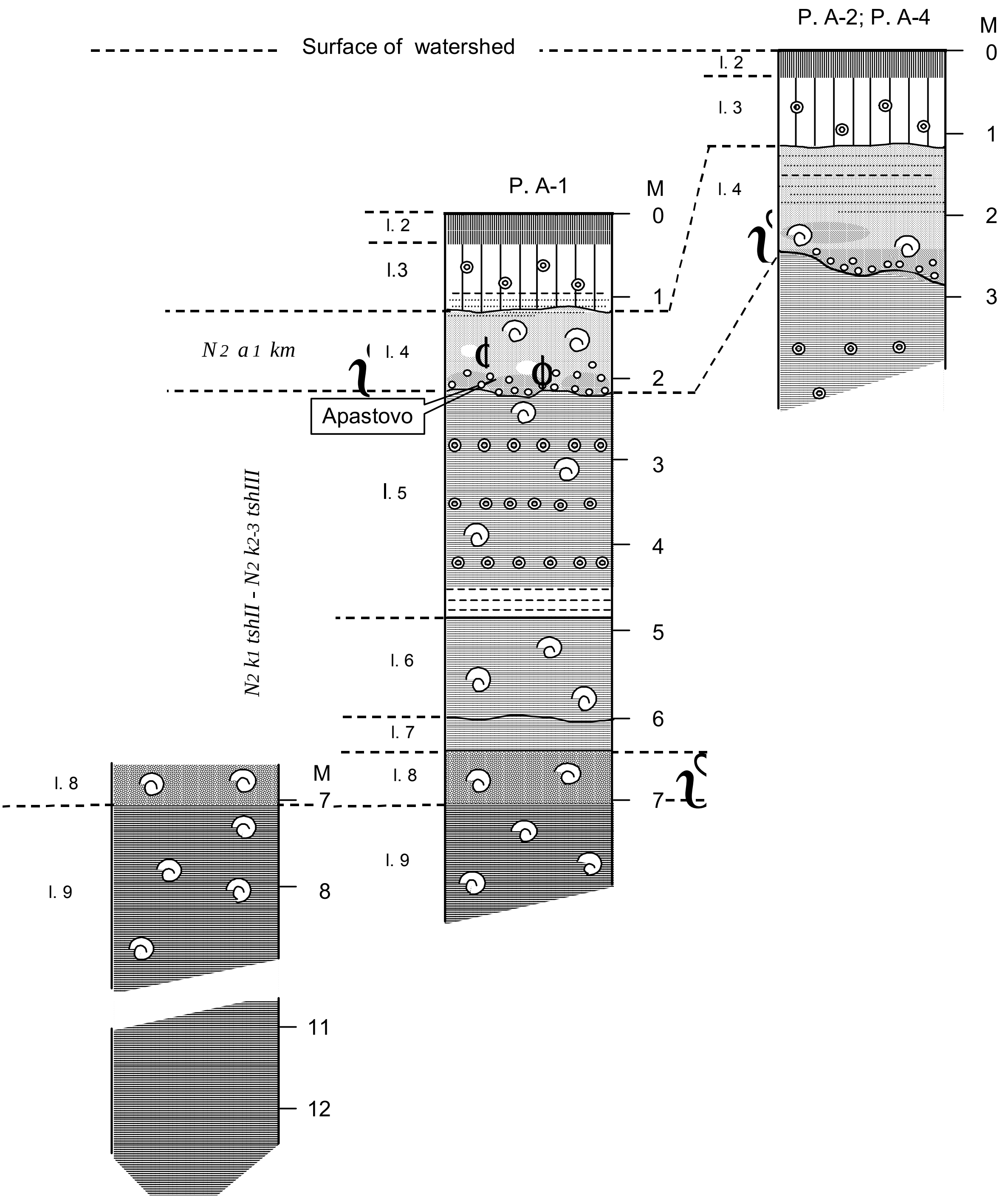
The composition of the community and evolutionary rank of the main groups allow for reliable dating the Apastovo Fauna. A large number of lagomorphs and the presence of rhizodont zokor, *Prosiphnaeus*, and the listed vole species are characteristic of only the Middle Pliocene, i.e., the Lower Villafranchian faunas. The same conclusion follows from the presence of the large shrew *Blarinoides*, small mole, etc. The vole *Mimomys* ex gr. *hajnackensis* Fejfar is an evolutionarily advanced form of the species. Its molars have tracks that are a little more advanced than those of the members of this group from the type locality, i.e., Hajnacka, Czechoslovakia. The members of the genera *Promimomys* and *Villanyia* are extremely similar to the voles of these species from Uryv–1 and Korotoyak–2 localities. In the Don Basin, similar communities are known from the Korotoyak–2 and Uryv–1 localities.

Among the assemblages from Bashkortostan, those from the Simbugino and Akkulaevo localities are most similar to the Apastovo Fauna. All of them are dated with certainty as MN16, i.e., the Middle Pliocene.

In the set of species, the Apastovo Fauna is similar to both Bashkyr and Don faunas; regarding the voles composition, it is similar to the faunas from Central and Western Europe; this allows for their reliable correlation. At the same time, the zoogeographic composition of the Apastovo taphocoenosis is closer to those of Bashkortostan. It includes such Asian elements as *Prosiphnaeus* and *Lemmini*, which occur in Symbugino and Akkulaevo and are absent from the Don associations.

The study is supported by a research grants from the Russian Science Foundation for Basic Research (№ 02–04–48458 and № 00–15–97754).

Apastovo locality of small mammals



SMALL MAMMALS FROM THE MIDDLE PLIOCENE OF THE SOUTHERN FORE-URALS

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The establishment in Sicily of the marine deposits of Gelasian and, hence, the Upper Pliocene as a new unit of the global stratigraphic chart requires a revision of the currently existing periodisation of the Late Cainozoic. This concerns, in particular, the continental deposits of the Russian Platform where the Upper and Middle Pliocene deposits should be distinguished. This is especially important with reference to such regions as Bashkortostan where direct correlation between continental and marine deposits can be performed. V.L. Yakchemovich and V.P. Sukhov provided the foundation for the solution of these questions. The material on small mammals collected by these researchers is the starting point for studying the biostratigraphy of the Late Cainozoic of the southern Fore-Urals and adjacent area.

In Bashkortostan, two Pliocene localities containing abundant small mammals, Akkulaevo–1 and Symbugino, were described.

The Akkulaevo locality is in the Dema River basin, a left tributary of the Belaya River near the Davlekanovo town. The base of the section is composed of the coastal-marine deposits becoming the river mouth deposits. These deposits contain a rich fauna of brackish-water molluscs of the Middle Akschagyl and bones of small mammals. A revision of material collected by V. P. Sukhov resulted in the following faunal list for Akkulaevo–1: Insectivora: ? Crocidurosorex sp., *Sorex* sp., and *Talpa* sp., Lagomorpha: *Ochotona* sp. and *Pliolagus* cf. *brachygnatus*, Rodentia: *Trogontherium* sp., *Apodemus* cf. *sylvaticus, Cricetus nanus, Cricetulus* sp., *Prosiphnaeus* ex gr. *praetingi*, *Villanyia* ex gr. *exilis*, *Borsodia* sp., *Promimomys gracilis akkulaewae, Promimomys baschkirica*, and *Mimomys polonicus*. Lagomorphs compose about 1% of the taphocoenosis. Voles of the genera *Villanyia, Promimomys*, and *Mimomys* appear highly specialised. Their molars have well-developed tracks, and teeth of *Mimomys* have external cementum. The above features allow one to correlate small mammals from the Akkulaevo Formation with the faunas from the second half of the Middle Pliocene, such as the Uryv–2 (Don River) and Rebelice Krolewski (Poland) faunas.

The Akkulaevo section contains two bone-bearing horizons with Eopleistocene small mammals, including *Allophaiomys*.

The Symbugino locality is in the Blagovar District in the Karmasan River basin. The bone-bearing layer is composed of sands and shingles of the Kumurly Formation. The revised faunal list of small mammals includes Insectivora: *Sorex* cf. *runtonensis, Sorex* cf. *minutus, Petenyia* sp., *Beremendia* sp., *Blarinoides mariae, Allosorex* sp., *Talpa* sp., *Desmana* sp., and *Erinaceus* sp., Lagomorpha: *Ochotona* sp. and *Pliolagus brachygnatus*, Rodentia: *Tamias orlovi, Spermophilus* sp., *Trogontherium minus, Castor* sp., *Sinocastor zdanskyi, Apodemus* sp., *Cricetus* sp., *Cricetulus* sp., *Prosiphneus* ex gr. *praetingi, Germanomys trilobodon, Synaptomys (Plioctomys) mimomiformis, Villanyia* ex gr. *exilis, Borsodia* sp., *Promimomys gracilis akkulaewae, Promimomys baschkirica*, and *Mimomys polonicus*. The proportion of lagomorphs in the Symbugino taphocoenosis is 10%. Insectivores and rodents are relatively diverse. However, the evolutionary level of voles is similar to that of voles from the Akkulaevo Formation. Their molars also have high tracks, and teeth of *Mimomys* have external cementum. This shows that small mammals from Symbugino are comparable to the faunas from the second half of the Middle Pliocene, such as the Akkulaevo, Uryv–2, and Rebelice Krolewski faunas. However, it is hardly probable that they are synchronous. The Symbugino Fauna dwelt in different, more favourable, palaeogeographical conditions and probably belonged to an earlier phase of the Middle Pliocene.

The stratigraphic position and correlation of the described faunas are shown in Table.

This study was supported by a research grants from the Russian Science Foundation for Basic Research (№ 02–04–48458 and № 00–15–97754).

Table. The stratigraphic position of the Pliocene faunas of small mammals from the Southern Fore-Urals

EPOCH		Stage	M.A.	MN, MQ	Don river basin: Locality	Belaya river basin: EPOCH	Polarity	Episode	Locality	Stage		Suite
PLEISTOCENE	LOWER	Calabria	0,8 1 1,2	19	Petropavlovka	MATUYAMA		J		Apsheronian	upper	Karmasan
PLEISTOCENE	LOWER	Calabria	1,2 – 1,8	18	Log Denisov, Uspenka Korotoyak-3a (-) Mikhailovka-1	MATUYAMA			Akkulaevo-3 Akkulaevo-2	Apsheronian	lower	Davlekanovo Dema
PLIOCENE	UPPER	Gelasian	1,8 2	17	Liventsovka (-)	MATUYAMA		Ol Il		Akchagylian	upper	Voevodskoye
PLIOCENE	UPPER	Gelasian	2,14	17		MATUYAMA		R	Akkulaevo-1	Akchagylian	middle	Akkulaevo
PLIOCENE	UPPER	Gelasian	2,32 – 2,6	16a	Uryv-2 (-)	MATUYAMA			Simbugino	Akchagylian	middle	Zilim- Vasil'evo
PLIOCENE	MIDDLE	Piacenzian	2,6 3 3,11 3,22 3,33	16b	Uryv-1, Korotoyak-2 Korotoyak-1(-)	GAUSS		K M		Akchagylian	lower	Kumurly Karlaman
PLIOCENE	LOWER	Zanclian	3,58 4	15	Korotoyak-Don (-) Gerasimovka	GILBERT				Kimmerian		III Cheben'kovo
PLIOCENE	LOWER	Zanclian	5	14	Antipovka (-), Chugunovka	GILBERT		Co Nv Sd Tv		Kimmerian		III Cheben'kovo
PLIOCENE	LOWER	Zanclian	5,23	13		GILBERT				Kimmerian		II Cheben'kovo

(+) normal polarity
(-) reversed polarity

CORRELATION OF THE EARLY PLEISTOCENE FAUNAS OF THE BAIKAL AREA AND EASTERN EUROPE

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Geological and palaeontological investigations performed in the Baikal area permit identification of principal complexes of the Late Cenozoic sediments, which are characterized by the abundant faunal and palynological data.

The detail analysis of the Pleistocene small mammalian faunas of the region show that they include some taxa widely distributed in Northern Eurasia. This evidence permits us to correlate the Early Pleistocene Siberian faunas with the European one on the base of small mammal data, in particular.

In Baikal area including the territories of Transbaikalia, Olkhon Island and Irkutsk Amphitheatre (Prebaikalia), the Early Pleistocene small mammal faunas are known from many sites. They are Dodogol 1, Dodogol 2, Zasukhino 2, Zasukhino 3, Tologoi 1.2, Tologoi 2.2, Ust Obor, Kudun etc. situated in Transbaikalia; the localities Yelga, Nyurgan – in Olkhon Island and the sites Malye Goly 3, Nikilei, Kachug, Manzurka a.o. located in Prebaikalia.

The faunas of these sites include *Allophaiomys pliocaenicus, Lagurodon arankae, Prolagurus ternopolitanus, Prolagurus pannonicus,* different taxa of *Eolagurus* and *Terricola*, which were very peculiar and common taxa for almost all localities of that time while each site contain many other taxa characteristic for the region.

Similar small mammal faunas of the same geological age are known in the Western Siberia (localities Kizikha, Razdolie, Makhanovo, Scorodum, Romanovo, Krapivy a.o.), in the Southern Ural and Trans-Ural (site Baturino), in Bashkiria (Davlekanovo, Chui-Atasevo), in northern Kazakhstan (loc. Charyn). There are many similar “Allophaiomys” faunas as well in the Eastern Europe, which are – Sinyaya Balka, Tsymbal, Nogaisk, Kairy, Tarkhankut, Tiligul, Mikhailovka 1, Zhevakhova Gora 5, 9, Uspenka, Port-Katon, Ushkalka, Chishmikioy and others.

The Early Pleistocene faunas are characterized by the first appearance of the genera *Allophaiomys, Lagurodon, Prolagurus, Eolagurus* and *Terricola*, by existing of the latest rooted arvicolids of the genus *Mimomys.* At that time several rodents of the Asian origin migrated to the Europe, which are jerboa (*Allactaga*), steppe lemming (*Eolagurus*), zokor (*Myospalax*), mole-voles (*Ellobius*) etc.

Mentioned above data permit us to correlate contemporaneous faunas of the east part of northern Eurasia and to provide also interregional correlation of early Pleistocene sediments.

ICE FLOW DIRECTION, MARGINAL AND GLACITECTONIC ZONES IN NORTH-EASTERN POLAND AND THEIR CONNECTION WITH DEEPER BASEMENT

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The results of geologic and geomorphologic studies indicated distinct tectonic influence on creation of the present surface of north-eastern Poland. The present relief was shaped by glaciotectonics and neotectonics connected with a structural plan of the old basement and activated along meridional and especially by parallel fractured zones. These zones were formed at the lithologic boundaries between Precambrian structural units of different density. Especially, the parallel fault zones had a basic effect on parallel direction of the many glacial origin forms of the recent landscape. These parallel fault zones influenced location and extent of marginal zones of the last glaciation age created by hills and ridges of the end and push moraines, subglacial channels, parts of river valleys as well as were influenced on the formation zones of the glaciotectonic deformations.

During the Pleistocene, starting from the oldest Narevian (Menapian) Glaciation, advancing ice sheets activated by loading (glacial periods) and unloading (interglacial periods) west-eastern and north-southern faults. They influenced limits and retreat standstills of the ice sheet, directly acted on development of morainal features with glaciotectonic-deformed structure. They also delimited individual ice streams, among others due to varied mobility of individual tectonic blocks. The present landscape of northeastern Poland has developed due to glaciotectonic deformations during the Vistulian (Weichselian) Glaciation. Glaciotectonic deformations depended on vertical neotectonic movements (glacioisostasy) that were activated by loading of the advancing ice sheet and were formed mainly along west-eastern zones of tectonic fractures in the bedrock.

During the Vistulian Glaciation the advancing ice sheet was divided on three ice streams: Gdansk Bay with general direction of the ice movement from north to south; Mazurian stream with ice movement from NW to SE and Lithuanian ones with ice movement from NE to SW.

These last ice sheet movement directions are generally conformable with directions of the positive and negative palaeo-structures within sedimentary cover and crystalline basement.

THE PROBLEM OF DETAILED CLIMATOSTRATIGRAPHY OF THE INTERGLACIALS AND GLACIALS OF THE LAST 200,000 YEARS IN THE LIGHT OF PALYNOLOGICAL RECORDS FROM DIFFERENT REGIONS OF THE RUSSIAN PLAIN

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Reconstructions of the long continuous vegetation and climate successions are a basis of palyno-climato-stratigraphy. We find the reconstructions of vegetation changes were occurred under influence of global climatic fluctuations in different regions of the Russian Plain during the last 200,000 years in large number of the publications. The phytocoenotic and floristic characteristics of interglacial optima and glacial pessimums of this long-duration interval and also the Mikulino and Holocene interglacial successions are submitted in them in most detail. It is much less volume of palaeobotanical data (especially, supplied by absolute data) that allows us to introduce the detailed characteristic of successive changes of flora and vegetation of all interstadial and stadial stages of the Dnieper and the Valdai glaciations.

Many problems of stratigraphy and correlation of the considered interval are not still solved. The data about duration and chronological borders of the Mikulino (Eemian) interglacial are debated. The question concerning a quantity of interstadial warmings within the Dnieper (Saalian) and Valdai (Weichselian) glaciations is also among actively discussed ones now. For the Dnieper glaciation two or three interstadials are reconstructed. Due to incompleteness of investigated sections, regional specificity of phytocoenotic and climatic changes and other reasons in the Northern East-European Plain within the Valdai glacial period from 7 up to 9 interstadials are reconstructed, and in the southern part of the Plain – from 3 up to 9 interstadials. The undeniable scheme of subdivision of the Early Valdai is not created so far. The most essential disagreements concern its detailed climatostratigraphic subdivision and the accurate temporal binding.

For the decision of some climatostratigraphic questions and with the purpose of revealing of regularities of the Pleistocene vegetation evolution the authors summarized the results of palynological and complex analyses more than 80 Late Mid-Pleistocene and Upper Pleistocene sections from different regions of the Russian Plain. The schemes of detailed climatostratigraphic subdivision of these sequences as well as the periglacial and interglacial vegetation successions during the last 200,000 years were made. The scales of zonal types of the Middle and Late Pleistocene interglacial and periglacial phytocoenosis were also composed.

Palynological records testify about complex climatorhythmics of the all interglacial and glacial periods of the last 200,000 years. Thus for instance in the loess regions of the Southern Russian Plain the complicity of the climatic fluctuations was characteristic for the both glacial epochs: (1) for the Valdai epoch we reconstructed the palaeoenvironments of 10 stadial intervals, 9 interstadials and some interphasials; (2) the Dnieper glacial rhythm was divided by the prolonged interstadial into two (Dnieper and Moscow) stages, with Early Dnieper and Late Moscow interstadials within them. According to N. Bolikhovskaya (1981, 1993, 1995) the Mikulino interglacial climatic rhythm is distinctly subdivided at thermo erotic and thermohygrotic substages and endothermic coolings. Main endothermic cooling is fixed between the specified substages and the other – in the first half of this interglacial. Other authors define the Mikulino endothermic coolings seldom. Numerous pollen records on territory of the Russian Plain testify a presence of the several thermal maxima and endothermic coolings in the modern (Holocene) interglacial.

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THE NEW CONCEPT OF THE ORBITAL THEORY OF PALEOCLIMATE AND SOME QUESTIONS OF THE PLEISTOCENE PALEOGEOGRAPHY

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The analysis of the recent empirical data (firstly spectral analysis of a deep-sea oxygen isotope (OI) curves) confirms the orbital hypothesis of palaeoclimate, which suppose the Earth's orbital elements variations to be a reason of global climatic oscillations in the Pleistocene. However this analysis also leads to the conclusion that the Milankovitch theory, which is the modern version of the orbital theory of palaeoclimate (OTP) has some essential contradictions with the empirical data. The most known of them is the problem of the 100-ka Pleistocene climatic periodicity. These disagreements mean that Milankovitch theory has essential defects. The main of them is that Milankovitch didn't take into account the *qualitative* differences between insolation signals connected with the variations of the different orbital elements when calculated orbitally defined summary insolation variations. The analysis of the basic assumptions of the Milankovitch theory leads to the conclusion that the insolation diagram calculated by Milankovitch for caloric summer insolation under 65° Northern Hemisphere latitude has no palaeoclimatic significance.

For this reason the necessity of the new concept of the OTP is obvious. I have been developing this new concept since 1998. One result of this work is the construction of the orbital climatic diagram (OCD), which shows the relative probability of the appearance of glaciations and interglaciations during the last million years. OCD corresponds well to the deep-sea OI curves. Comparison of the OCD and OI curves allows identifying 8 glaciations and 9 interglaciations intervals in the OCD during the Brunhes chron. Note that the OCD maximum corresponding to the warm OI stage 19, which includes the Matuyama–Brunhes inversion is close in time to 780 ka, i.e. nearly coincides with the recent dating of this reversal. Generally good similarity between the OCD and OI curves on the one hand directly confirms the determining influence of the orbital insolation variations on the rhythm and tendency of the global climatic changes over the last million years. On the other hand it confirms climatochronostratigraphic subdivision of the OI curves.

Consequently it should be revealed 9 interglaciations and 8 glaciations during the last 780 ka in continental deposits too. However it should be noted that the global correlation of a deep-sea and continental palaeogeographic events ought to base not on the *quantity* of warm and cold periods in continental records but on their *qualitative* conformity. In other wards it would be shown that continental warmings and coolings have the same climatic significance as even (glaciations) and odd (interglaciations) OI stages. One of the problems of such correlation is the contradiction of the Matuyama–Brunhes reversal position in deep-sea and continental deposits. As was mentioned above the Matuyama–Brunhes inversion is registered in the interglaciation OI stage 19 for the deep-sea cores. However it commonly registered in loess horizons of loess-soil outcrops. It is well known that the loess horizons are usually correlated with the glaciations.

The investigation of the conformity between the new OTP concept and palaeogeographical data leads to the conclusion that the existence of an ice sheets has decisive significance for the establishing of the physical mechanism and of the orbital periods for the Phanerozoic climatic changes. It is the ice global volume, which is the decisive factor of the main climatic period change from 41 ka to 100 ka about one million years ago and of the deficiency of the eccentricity 400 ka climatic cycle in the Pleistocene.

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VERTEBRATE ASSEMBLAGES VERSUS DEPOSITIONAL ENVIRONMENTS IN THE LATE-MIDDLE PLEISTOCENE – LATE PLEISTOCENE OF SICILY (ITALY)

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Sicily, the largest Mediterranean island, experienced at least five vertebrates dispersal events during the Pleistocene, which are different in provenance (African and / or European) and have been controlled by filtering barriers of different intensities. From the older one to the younger one, faunal complexes show an increasing biodiversity, a decreasing endemism degree, and a composition more and more similar to that of the southern Italian peninsula

Fossil documentation of Quaternary vertebrates in Sicily is also not evenly distributed in time. A trend is evident towards a richer fossil record from the Early Pleistocene to the Late Glacial, fossils of the latter age being most widespread.

The geographic and stratigraphic distribution greatly varies in space and time (younger sites are much more numerous). That could be related to the complex of the insular system. Such distribution pattern is typical in regions in which tectonic activity is very intense and is probably due to the different extension in time of the emerged areas, which implies sharp lateral variations of the depositional environments.

The active extensional tectonic regime affecting Sicily from the Early Pleistocene onwards resulted in the collapse of peripheral zones and lead to the creation of a series of deep marine basins which occupied large areas around and between two emerged blocks (North and South eastern areas, respectively). These two islands were of small extension as well as the related depositional environments. In fact, the number of the deposits containing the two oldest faunal complexes (M. Pellegrino and *Elephas falconeri* F.C.), which are early and early-middle Pleistocene in age, is very low. Conversely, the vertebrate bearing deposits of the late-middle and early-late Pleistocene assemblages (*Elephas mnaidriensis* faunal complex) are very numerous, are contained in deposits of different environments and have a wide distribution all over the island.

From the beginning of the Middle Pleistocene onwards the evolution of Sicily was characterised by a generalised uplift, which lead to the emersion of the previous deep marine basins, and the island reached almost the present extension, being also bordered by a crown of coastal plains. For that reason, a large amount of the mammalian fossils of the *Elephas mnaidriensis* F.C. are from upraised remnants of coastal plains as well as from caves and fissures.

During the late Pleistocene a strong uplift accompanied by the contemporaneous sea water low-standing lead to the disappearance of humid coastal plains. As a matter of fact the deposits of the youngest faunal Complex (“Pianetti – S. Teodoro” and “Castello” F. C.) are numerous but they are limited to caves and fissures. The faunal composition of this complex is consistent with the disappearance of humid environments (coastal plains with lagoons or swamps) and the laying down of dry conditions.

EAST EUROPEAN QUATERNARY IN THE LIGHT OF ASTROSTRATIGRAPHY

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1. Future stratigraphical scale will be elaborated on the base of astronomical cycles of Earth rotation and Global changes, using of technique of astrostratigraphy.

2. Model of astrostgratigraphy (Hilgen, 1995–1998) based on Earth rotation cycles with duration 20, 40, 100 ka and integrated orbital cycle 400 ka, can be used for formalization of stratigraphical scale.

3. The most visible glacial-interglacial cyclicity connected with excentrity cycle (EXC) 100 ka is developed in stratigraphical interval of the Middle and Late Pleistocene during last 800 – 900 ka. Eight cycles were studied in riverine and marine terraces, loess-paleosol sequences, as well as in glacial-interglacial consequences.

4. Oblignity cycles 40 ka (OBC) developed in Early Pleistocene, especially in Loess series (Dodonov, 2001) and in some riverine terraces in the Late Pleistocene.

5. Cyclicity 20 ka (PRC) is good distinguish during the late Pleistocene: five river terraces of the Don, Seim, Dniester and other rivers, 5 fossil soils in some loess sections (Alexandrovka, Kursk region) were established. This cyclicity was also studied in Valdai (Wurmian) glacial sediments and out of this area, for example, in coral marine terraces of Papua – New Guinea (Chappel, 1976).

6. Integrated orbital cyclicity named Big Orbital Cycle (BOC) 400 ka is registered in the Middle and Late Pleistocene (two BOC) and in the Early Pleistocene (two BOC).

7. Double orbital cycle (DOC) 800–900 ka represented in Quaternary stratigraphy as the Early Pleistocene (Eopleistocene of Russian scale) and the Neopleistocene of Russian scale.

8. Finally, the biggest stratigraphical super unit, or stage Unit Cycle (SUC) 1,8–2,0 million years coincides with the time span of Quaternary.

9. All these astrostratigraphical units also represented in older sediments. Last 3 mentioned cycles represented in Neogene stratigraphy as stages and substages. For example: Piacencian and Gelasian coincide with DOC (800–900 ka) as well as Zanclean, Pontian, Kimmerian, Akchagylian, Kujalnikian, Macotian stages, and Late Pliocene coincide with SUC.

10. Astrostratigraphical time scale of the Late Cenozoic is represented in this paper.

NEW LOCALITIES OF THE FRESH-WATER AND LAND MOLLUSCS IN THE MIDDLE PLEISTOCENE DEPOSITS OF THE UPPER DON BASIN

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Several collections of fresh-water and land mollusks were collected while researching of sites in the region in the years 2000–2001. So it is possible to make some palaeoclimatic conclusions after author has studied them.

Log Krasnyi. This site is located near village Uryv (Voronezh region). In the base of the sub-aerial complex under Donian till is placed alluvium of the Petropavlovka suite with the remains of small mammals of the Early Tiraspolian complex (*Microtus oeconomus*). The little collection of the mollusks includes forms, specific for steppe landscape with forest floodplains (*Vitrea cristallina*, specific for forests was found here).

Verkhny Ol’shan. The site is located in the village Veretye (Voronezh region). The abundant collection was gathered from alluvial deposited in the lower part of Kalach suit (Ilyinka super-horizon). Here are present some thermophil forms (*Fagotia* ex gr. *acicularis*, *Gastrocopta theeli, Theodoxus* ex gr. *pallasi*). Also some forms, later disappear here, were found here (*Lithoglyphus pyramidatus, ? Micromelania (Turricaspia)* sp.). This complex is specific for Middle Pleistocene pre-Donian time with forest-steppe landscape and temperate climate.

Uryv. There is the big collection gathered from alluvial deposits of upper (floodplain) part of Veretye suit (Ilyinka super-horizon). There are forms, specific for dry and very cold climatic condition (loessic complex) – *Vallonia tenuilabris* and *Pupilla loessica*. This complex can be understood as cold steppe complex.

PLIOCENE MOLLUSCS OF THE SOUTHERN FORE-URALS

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Molluscs shells have been distributed in Pliocene deposits not evenly. The Upper part of the Akkulaevo suite (Middle Aktschagyl) characterized by mollusks better than other Pliocene suites. In alluvial and liman deposits of the Upper Aktschagyl molluscs were rare. Davlekanovo deposits of the Lower Eopleistocene have been characterized by species variety of molluscs. In the Pleistocene and the Holocene deposits molluscs have been met often in lacustrine deposits of interglacial periods.

Three molluscs complexes could be determined in Pliocene deposits: Lower Aktschagylian, Middle Aktschagylian and Upper Aktschagylian.

Lower Aktschagylian mollusc's complex (localities: Symbugino, Staro-Sultangulovo). The most part of this complex presented by fresh water Bivalves and Gastropods mainly and rare euryhaline brackish water *Caspia turrita* G. Pop., *Clessiniola julaevi* G. Pop., *Dreissena polymorpha* Pall. var. *angustiformis* Koles. which are presented in the upper part of these deposits.

Middle Aktschagylian mollusc's complex (localities: Akkulaevo, Novo-Sultanbekovo, Sultanaevo, Yulushevo, Karmaskaly and others). In this period was maximum of the Aktschagylian transgression and waters of the sea come far to the north. The development and the change of biocoenosises could be well traced. The influence of the fresh waters (rivers, different types of lakes) on the marine and brackish water communities has been marked on the territory of the Southern Fore-Urals. Representatives of different ecological groups could be found together in one thanatocoenosis. The Upper part of the Akkulaevo suite characterized by rich species variety of fresh water molluscs such as Unionidae (*Unio*, *Potamida*, *Psilunio*, *Rugunio*) and Viviparidae of the Levantine type, *Bithynia*, *Valvata*, *Lithoglyphus* and others and brackish water molluscs (*Cerastoderma, Aktschagylia, Clessiniola*) which existed in the warm climate. Such genera as *Bogatchevia*, *Rugunio*, *Ritia*, *Psilunio*, *Ebersininaia* became extinct at the end of the Pliocene time. Some other fresh water species also were members of that complex. Limnaeidae, Valvatidae, Planorbidae, Sheridan became wide spreader in the Pleistocene and the Holocene.

Upper Aktschagylian mollusc's complex (locality: Voevodskoye). Upper Aktschagylian deposits have been formed in the brackish water basin. Molluscs represented by brackish water molluscs (*Aktschagylia, Clessiniola, Cerastoderma*) and fresh water molluscs (*Dreissena, Unio*, *Sphaerium, Valvata Planorbis* and others). Species of the Levantine type have been disappeared in the end of the Aktschagyl period when became colder and appeared in the beginning of the Eopleistocene.

Microcondylaea, *Unio*, *Bogatchevia*, *Pseudosturia, Viviparus*, *Corbicula*, *Bithynia*, *Valvata*, *Lithoglyphus*, *Planorbis*, *Pisidium* lived in the beginning of the Eopleistocene.

Two mollusks complexes could be determined in Pleistocene deposits: Lower – Middle Neopleistocene and Upper Neopleistocene – Holocene. These complexes presented by fresh water and land molluscs. Almost all species are hydrophilic and inhabited moist places. Small sizes of shells indicated cold conditions during glaciations and insufficient warm climate of interglacials. Community with *Succinea oblonga* Drap. have been characterized glacial deposits of the Late Pleistocene.

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LOESS FORMATION OF NORTHERN EURASIA: STRATIGRAPHY AND CORRELATION

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Loess-palaeosol formation is widespread in different landscapes and climatic zones. Taking into account the peculiarities of loess and palaeosol structure and specific source of dust sedimentation three sub-latitudinal zones are distinguished in Northern Eurasia: (1) subtropical desert-loess zone, (2) temperate periglacial loess zone and (3) sub-arctic frozen loess zone. All three zones are represented in Asia while only the periglacial loess zone is known in Europe. For the desert-loess zone is characteristic the lack of the cryogenic structure whereas in the periglacial zone the features of former permafrost are definitely recognizable particularly in the late Middle and Upper Pleistocene loess horizons. The ice frozen loess formation (complex) or so-called edoma suite represented in Central and Northern Yakutiya contains syngenetic ice veins. The question of the origin of the loess and loess-like deposits in a glacial edoma remains to be very disputable between many researchers.

Different approach in understanding the glacial/interglacial events in arid and semi-arid zone interpreted by some scientists consequently as pluvial / interpluvial epochs resulted in a confusion for correlation of loess and palaeosol horizons of Central Asia with glacial / interglacial units of the periglacial zone in South Siberia and Russian Plain.

Stratigraphic data show that the beginning of loess formation in different zones and provinces of Eurasia started with big discrepancy up to 1 Ma and even more depending on the rate aridization and sedimentary environment. The earliest records of loess formation at 2.5 Ma are documented in desert-loess zone in Northern China and Central Asia. However, according to the new data on the Red Clay formation the aeolian sedimentation occurred during the Middle and Upper Pliocene. Over 30 palaeosol horizons are assumed to have formed during the Matuyama chron in loess sections of Southern Tajikistan. From the Olduvai subchron to the Matuyama–Brunhes reversal 23 palaeosol horizons (PC10–PC32) have been recorded. The duration of 40 ka of the pedosedimentary cycles in this interval corresponds to the palaeoclimatic cycles indicated in the oxygen isotope scale. In North China, the same stratigraphic interval in the Wucheng series and lower Lishi includes 15 (S8–S22 – Xifeng) or 17 (S8–S24 – Baoji) palaeosols. If one uses the criteria of the quantity (number) of palaeosols it is questionable whether the Wucheng and lower Lishi loess-palaeosol succession corresponds to the Lower Pleistocene loess-palaeosol alternation in South Tajikistan. Different depths of weathering for soil forming processes and variable loess sedimentation rate during arid intervals resulted in compaction of palaeosols could provoke different number of pedosedimentary units in the Lower Pleistocene observed in South Tajikistan and North China.

Using the thermo luminescence dates and the Matuyama–Brunhes boundary as the chronological control for interregional correlation there is concluded a different number of palaeosols for the Brunhes chron from North China – S1–S7 to Central Asia (Southern Tajikistan) – PC1–PC9 and South Russian Plain – seven pedocomplexes. The chronological classification of loess-palaeosol formation is open for further uncertainty because of the lack of agreement about the principles for distinguishing pedosedimentary cycles and sub-cycles in different palaeogeographical zones. For instance, the Upper Pleistocene interstadial palaeosol, like Bryansk, is not defined in the palaeosol nomenclature of arid and semi-arid zone of Central Asia and North China. S5 in North China is assumed to be complicated and is equal to PC5 and PC6 in South Tajikistan. The lower Middle Pleistocene Vorona and Kolkotova pedocomplexes in South Russian

Plain have been formed during the generally lower rates of loess deposition that have resulted in more welding of pedosedimentary units.

Magnetic susceptibility fluctuations are taken for reflect the climatic changes do not have the uniform meaning in the arid and humid regions. New data on electronic microscope studies of magnetic minerals in palaeosols of South Tajikistan show their enrichment by thin dispersed magnetite, which could be formed as a result of biomineralization processes. High content of thin dispersed magnetite in palaeosols and its influence on magnetic susceptibility records suggest that the activity of bigenic processes could be directly/indirectly controlled by palaeoclimatic changes. These circumstances are very important for climatostratigraphy and correlation of loess-palaeosol series.

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REVISION OF GENUS LIMNOCYTHERE BRADY, 1868 AND BIOSTRATIGRAPHICAL DIVISION OF PLEISTOCENE DEPOSITS OF UKRAINE

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Ostracods of genus *Limnocythere* Brady, 1868 are widespread in Quaternary alluvial deposits of Ukraine. *Limnocythere* is known and monographical described from Pliocene and Quaternary deposits of Russia (Lubimova, 1960; Karmishina, 1966; Popova-Lvova, 1972, 1977; Kazmina, 1975; Negadaev-Nikonov, 1955, 1957, 1989), Azerbaijan (Agalarova et al., 1961), Lithuania and Byelorussia (Zubovich, 1978, 1983), Moldova (Negadaev-Nikonov, 1965, 1971, 1974, 1989; Kovalenko, 1976). *Limnocythere* existed during Quaternary period and are of great importance for biostratigraphic subdivision.

The alluvium of the fourth terrace contains carapaces of the *Limnocythere tuberculata* species, the sole and roof of the alluvium being the upper and lower limits of this species distribution. According to the wide geographical (Eastern Europe) and narrow stratigraphic (Interglaciation of the beginning of the Middle Pleistocene) distribution of the *Limnocythere tuberculata* species biostratigraphic *Limnocythere tuberculata* zone ("Taxon–Range–Zone *Limnocythere tuberculata*") is distinguished in the Middle Pleistocene deposits. Lower stratigraphic boundary of the *Limnocythere tuberculata* zone is the passage Lower–Middle Pleistocene deposits where the first appearance of the *Limnocythere tuberculata* shells was fixed. These deposits were described by Negadaev-Nikonov from Tiraspol section on the river Dniester (Moldova) where they form the upper part of the fifth terrace alluvium (flood plain facies). The upper boundary of the *Limnocythere tuberculata* zone is drawn in the roof of the alluvium of the fourth terrace (Ukraine, the river Yalpug, Ozernoe village). Above, the remains of the *Limnocythere tuberculata* shells were not found in the alluvium of the third terrace. Other investigators give no evidences about finds of this species in more young than the deposits of the beginning of the Middle Pleistocene too. Sections near Gunky village (Poltavsky province, the Psel, the left tributary of the Dnieper) and Ozernoe village (Odessky province, the Jalpug, the left tributary of the Danube) are determined as the composite stratotype of the biostratigraphic *Limnocythere tuberculata* zone in the territory of Ukraine. It is compared with Zavadovsky, Orelsky, Potyagaylovsky, Dnieprovsky horizons in the territory of Ukraine; Likhvin, Orchiksky, Romensky, Dnieper horizons in the territory of the central part of Eastern Europe; 8–11 stages of isotopic scale.

Strata containing *Limnocythere sancti-patricii* have been distinguished in the alluvium of the third terrace (Middle Pleistocene). It is compared with Kaydaksky, Tyasminsky horizons in the territory of Ukraine; Shklovsky, Moskovsky horizons in the territory of the central part of Eastern Europe; 6–7 stages of isotopic scale.

Acme–Zone *Limnocythere sancti-patricii* have been distinguished in the alluvium of the second terrace (Upper Pleistocene. It is compared with Priluksky, Udaysky, Vitachevsky, Bugasky horizons in the territory of Ukraine; Mykulinsky, Kalininsky horizons in the territory of the central part of Eastern Europe; 5–4 stages of isotopic scale.

167 species of genus *Limnocythere* were analyzed from Neogene and Quaternary deposits in the territory of Eastern and Western Europe, partially from Asia (Caucasus, Turkmenistan, Western Siberia), North America. The volume of species was changed as a result of the revision.

Species *Limnocythere* ex gr. *inopinata* (Baird, 1843), *L. postconcava* Neg., 1955, *L. directa* Zub., 1983, *L. manjtschensis* Neg., 1955, 1955 and subspecies *L. inopinata inopinata* (Baird, 1843), *L. inopinata* cf. *postconcava* Neg., 1955, *L. inopinata pleistocenica* Krstić, 1987 were included in the volume of species

Limnocythere inopinata (Baird, 1843). Species *Limnocythere fontinalis tuberculata* Neg., 1971 and *L. usenensis* Karm., 1966 were included in the volume of species *Limnocythere inopinata* (Baird, 1843). Species *Limnocythere fontinalis* Schn., 1962 and *L. procera* Zub., 1983 were included in the volume of species *Limnocythere sancti-patricii* Br. et Rob., 1869. Species *Limnocythere grinfeldi* Liep., 1960 was included in the volume of species *Limnocythere grinfeldi* Liep., 1960. Species *Limnocythere flexa* Neg., 1957 was included in the volume of species *Limnocythere pseudoconcava* Neg., 1955. Genus *Limnocythere* includes three subgenera: *L. (Limnocythere)* Negadaev, 1968, *L. (Limnocytherina)* Negadaev 1967–1968 and *L. (Frontocytherina)* Negadaev, 1974.

Subgenus *L. (Limnocytherina)* Negadaev, 1967–1968 was distinguished on the basis of particularities of the carapaces form, which was characterized as "oblong with low short anterior part and more high elongate posterior" (Negadaev-Nikonov, 1974). According to researches of other authors (Shornikov, 1969; Kazmina, 1975; Kovalenko, 1976; Martens, 1990, 1994; Griffiths, 1993), studying fossil and recent Ostracods it is a main sign of sexual dimorphism of *Limnocythere* genus species and it is characteristic for males. In conformity with this and the article 23 (e), 66, 67 (i), 70 © (I) of the "International Code of Zoological nomenclature" a revision of this subgenus species was carried. The species *Limnocythere fontinalis tuberculata* Neg., 1971 (Negadaev-Nikonov, 1974, p. 154–155, tabl. XVI, fig. 4) was determined as a male of species *Limnocythere tuberculata* Neg., 1957; species *Limnocythere manjtschensis* Neg., 1955 (Negadaev-Nikonov, 1974, p. 151–152, and tabl. XVI, fig. 5) – as a male of species *Limnocythere inopinata* (Baird, 1842); species *Limnocythere fontinalis* Schn., 1962 (Mandelshtam et al., 1962, p. 275, tabl. XLIV, fig. 10) and *Limnocythere procera* Zub., 1983 (Zubovich, 1983, p. 56–58, tabl. IV, fig. 7) – as a male of the *Limnocythere sancti-patricii* Br. et Rob., 1869.

BIOSTRATIGRAPHY OF THE SOUTH-EASTERN SIBERIA

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The south of Siberia is a part of the Baikalian region located in the Central Asia. It includes the areas of Prebaikalia and Transbaikalia. The earliest Pliocene strata known as Anosov Suite is widely distributed in the South Baikal depression. No fossil mammal remains were found here. The **Early Pliocene** small mammal faunas are known in Prebaikalia as Olkhonian (MN 14) and Khuzhirian (MN 15), which include *Hypolagus* sp., *Ochotonoides complicidens*, *Kowalskia* sp., *Polonomys insuliferus, and Promimomys* cf. *gracilis* a.o.

The **Middle Pliocene** fauna is known from several Transbaikalian sites. The stratigraphically oldest fauna is Udunginian containing *Hypolagus* (two taxa), *Ochotonoides complicidens*, *Orientalomys sibiricus*, *Gromovia daamsi*, *Promimomys* cf. *stehlini*, *Villanyia* cf. *eleonorae*, *Mimomys* sp., *Prosiphnaeus praetingi* a.o. The next fauna of Chikoi Complex is slightly younger than the preceding one and includes *Beremendia fissidens, Petenyia hungarica, Ochotona gromovi, O. sibirica, Orientalomys sibiricus, Prosiphnaeus praetingi, Villanyia eleonorae, Mimomys minor* a.o. These faunas are referred to the MN 16 with subzones A and B respectively.

The next, **Late Pliocene** stage of the faunal succession in the East Siberia is discovered in the localities of Klochnevo 1, 2, Zasukhino 1 in Transbaikalia and Podtok, Cherem Khaem, Malye Goly 1, 2, Anchuk in Prebaikalia. They are referred to the zone MN 17.

Transbaikalian faunas of this age are known as Itantsinian Faunistic Complex that includes *Ochotona* cf. *intermedia, Spermophilus itancinicus, S. tologoicus, Villanyia klochnevi, Clethrionomys* sp., *Episiphneus youngi*, *Cromeromys* sp. etc.

Prebaikalian mammal associations known from several sites include taxa: *Sorex* sp., *Hypolagus* sp., *Ochotona* sp., *Clethrionomys* cf. *rutilus, Villanyia angensis, V. lenensis, V.* cf. *chinensis, Mimomys pliocaenicus, Cromeromys intermedius, Prosiphnaeus* sp.

The **Early Pleistocene** is the following stage of the faunal succession. Small mammal assemblages are known from several localities both in Prebaikalia and in Transbaikalia.

The faunas of that period are characterized by the first appearance and evolution of the genera *Borsodia, Allophaiomys, Lagurodon, Prolagurus, Eolagurus, Terricola, Lasiopodomys, and Myospalax.* Among the Early Pleistocene faunas four successive substages are established on the base of the evolutionary development of the species and of analysis of the faunal composition.

Within the **next Middle Pleistocene** fauna also four successive substages in the small mammalian evolutionary development of the Transbaikalian area also are established. The faunas of these stages differ from each other by the appearance of some new species and by their quantitative ratios. They reflect local stratigraphical sequence. The main character of the Middle Pleistocene faunas is the disappearance all rooted voles as well rootless archaic arvicolids *Allophaiomys, Lagurodon, Prolagurus* and *Terricola,* appearance of the genera *Ellobius*, *Meriones* and *Lagurus* and flourishing of *Eolagurus simplicidens, Allactaga sibirica* and *Spermophilus gromovi.* The Late Pleistocene faunal assemblages in Transbaikalian area differ from each other mainly by quantitative ratio of species whereas in Prebaikalia they differ much by their species composition.

PLIOCENE, PLEISTOCENE AND HOLOCENE VEGETATION OF THE SOUTHERN URALS REGION

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Late Kinel floras existed during the sedimentation of the deposits of the Karlaman and Kumurly suites. During this time the total number of species decreased and to the end of this time all before-Pliocene relics and many Pliocene species disappeared. Coniferous forests with broad-leaved trees admixture have been spreaded to the south. *Pinus* and *Picea* dominated in the taiga forests and the part of broad-leaved trees decreased in the northern direction.

The flora of the Aktschagyl type existed during the Middle Aktschagyl in the Zilim-Vasiljevo and Akkulaevo time. During the first part of the Zilim-Vasiljevo time steppe with small *Betula* and broad-leaved forests were wide spreaded. Coniferous *Picea-Tsuga* and *Picea-Abies* forests dominated in the second part of the Zilim-Vasiljevo time. The part of the deciduous trees decreased.

During the Akkulaevo time the taiga forests alternated several times by xerophyte steppe with small *Betula*-broad-leaved forests.

In the Late Aktschagyl (Voevodskoye time) *Artemisia*-Chenopodiaceae and herbage-Poaceae steppe was wide spreaded.

Before the Eopleistocene time the climate became colder and moisture increased. The taiga forest with *Pinus*, *Abies* and *Tsuga* has been spreaded to the south.

The modern flora existed on the territory of the Southern Fore-Urals from the beginning of the Eopleistocene. Forest-steppe and steppe dominated during the Dema and Davlekanovo time on the most part of the Fore-Urals. During the Karmasan time (Late Eopleistocene) herbage-*Artemisia* steppe changed by coniferous – broad-leaved forests and then by *Betula-Pinus* forests. The part of broad-leaved trees decreased and species variety of grasses reduced.

In the Early Neopleistocene (Petropavlovsk time) taiga forest with small quantity of *Betula, Tilia* and *Fraxinus* covered the most part of the territory. In the beginning of the Minzityarovo time the climate was warm then became colder. In this time the open woodlands were wide spreaded and were covered by *Artemisia*-Chenopodiaceae-herbage associations. The part of *Pinus* decreased and broad-leaved trees disappeared. In the Early Chui-Atasevo time herbage-*Artemisia* steppe and *Betula* forests with *Tilia, Carpinus, Quercus* and *Fraxinus,* existed. In the Middle Chui-Atasevo time climate became colder and moisture increased. In this time the taiga forests dominated. In the Late Chui-Atasevo time broad-leaved-*Betula* forests and meadow-steppe were spreaded. Periglacial landscapes dominated during the Oka cold time.

In the Middle Neopleistocene of the Southern Fore-Urals two warm (Likhvin and Chekalin) and two cold (Kaluga and Moscow) epochs well traced. Open woodlands covered by herbage-steppe communities predominated in the beginning of the Likhvin time. In the second part of this time the role of taiga forests increased. In the beginning of the Kaluga time cold steppe conditions dominated then the role of *Picea* taiga forests increased. In the beginning of the Chekalin interglacial the role of coniferous forests increased then *Pinus-Betula* forests with broad-leaved trees dominated. *Picea* forests were spreaded on the northern part of the territory. Herbage-*Artemisia* steppe with rare coniferous forests prevailed in the Moscow time.

The Late Neopleistocene could be subdivided into two warm and two cold phases. Forest-steppe and steppe (southern parts of the region) and *Betula-Pinus* forests with *Ulmus*, *Quercus, Carpinus* and *Tilia* (northern parts of the region) dominated during the Mikulino time. In the beginning of the Kalinin time broad-leaved trees disappeared from the forest biocoenosis, the percentage of coniferous trees, Chenopodiaceae increased, *Ephedra* appeared. *Abies-Picea-Pinus* forests with small quantity of broad-leaved trees prevailed in the Leningrad time. In Ostashkovo time was cold climate and herbage-*Artemisia*-Chenopodiaceae meadow-steppe associations dominated on the southern part of the territory and on the latitude of Ufa town. In the northern parts of the region *Picea-Pinus* forests with *Betula* admixture predominated.

Data about the vegetation of the Late Glacial time are not numerous. The Early Dryas was not well determined. The Bölling was described near Karmaskaly district centre (the Chatra creek). Single *Tilia, Betula* and *Pinus* sect. *Cembrae* were found in *Picea* forests of that time. In the Early-Middle Dryas time open woodlands with Cyperaceae, Poaceae, *Artemisia* and Chenopodiaceae predominated in the Southern Fore-Urals. Rare *Betula-Pinus* forests covered small squares. During the Alleröd time *Pinus* forests with *Picea, Tilia* and *Betula* were wide spreaded. Meadow-steppe associations with coniferous-*Betula* sparse growth of trees existed in the Late Dryas.

Five phases of vegetation changings could be marked in the Holocene time on the territory of the Fore-Urals. *Betula* forests with small admixure of coniferous and broad-leaved trees characterised the Preboreal time; herbage-*Artemisia* steppe has been dominated in the forest-steppe zone.

Forests with coniferous (Pinus) trees existed in the Boreal time. The part of *Picea* and broad-leaved trees increased in forests of the Atlantic Time. *Pinus* were usual in forests of northern territories, *Tilia* and *Betula* dominated in forests of southern parts of the Subboreal time. The type of the vegetation during the Subatlantic time was closely to the modern type: *Picea-Pinus* forests in the northern part of the Southern Fore-Urals and with admixure of *Quercus* and *Ulmus* in the southern part. The part of the open woodlands increased to the end of that time.

Materials are combined after V. K. Nemkova (1976, 1978, 1981, 1992), V. K. Nemkova and V. A. Klimanov (1988), V. L. Yakchemovich et al. (1970, 1988).

THE MATUYAMA / BRUNHES BOUNDARY IN LOESS SECTIONS IN THE SOUTH OF THE EAST EUROPEAN PLAIN AND THEIR CORRELATION ON THE BASIS OF PALEOMAGNETIC AND PALEOPEDOLOGIC DATA

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Position of the Matuyama/Brunhes boundary (MBB) in regard to Quaternary pedostratigraphy in the south of the East European Plain is still a matter of controversy. New data on MBB in loess/soil sequences in the western Black Sea area is used here for possible correlations with other regions. In the Black Sea area, Vorona pedocomplex of Velichko [1990] is an important stratigraphic marker. In the type section of the V Dniester terrace at Kolkotova Balka (Tiraspol), Vorona PK is the fourth from the surface, i.e. PK4, strongly developed interglacial soil directly overlying alluvium with Tiraspol fauna. In autonomous geomorphic situations, Vorona PK is a paleo-chernosem soil with characteristic reddish hue, high as magnetic susceptibility as remnant magnetization and accumulation of super paramagnetic iron oxides, hydroxides and pedogenic SD–MD magnetite. In subaerial mantles of older terraces, the MBB was found below Vorona PK (PK4), in loess between PK6 and PK7 in Roxolany (VIII Dniester terrace) and in PK7 in Novaya Etuliya (XII Danube terrace). In these ways, MBB, though bearing subtle stratigraphic discrepancies, is separated from Vorona PK by *at least one or two interglacial soils*, lying within so called triple pedocomplex, which comprises closely spaced PK5, PK6, and PK7 palaeosols. Interestingly, the soils of a triple PK are brown calcareous soils, occasionally with vertical features and minimal translocation of clay. Morphologically they are clearly differentiated both from the overlying Vorona PK and from underlying strong palaeosols.

In the central regions of the East European Plain, Vorona PK overlies Don moraine in the Don River basin. Between Don moraine and Pliocene Red Clay Formation lies a soil/loess sequence that includes Iljinsk stratigraphic unit with three palaeosols and a strongly developed Balashov (Petropavlovka) soil with MBB, according to Breslav et al. [1992]. However, new data from Strelitsa in Don glacial area allow us to raise the MBB up to a middle part of Il'yinsky unit. Beyond limits of Don glaciation, in the sites of Volgodonsk and Otkaznoe, MBB was found below Vorona PK in loess, which is related by Virina and Udartsev [1995] to Don loess. Alternatively, Bolikhovskaya [1995] equates this with one of loess horizons on the basis of Il'yinsky unit. If so, series of incipient palaeosols within this thick loess horizon, albeit inadequately pedologically defined, can be given higher stratigraphic rank, and then Il'yinsk unit, including three palaeosols, will be correlative with a triple palaeosol, pre-dating Vorona PK, in the Black Sea area. Hence MBB seems to be in reasonable agreement with the Black sea area.

Current substantial discrepancies in the position of MBB in regard to pedostratigraphy in the East European Plane apparently result from different factors. Apart from a complex magnetization process like in other loess areas of the world, in East European Plain reduced rates of loess deposition, syn-sedimentary pedogenesis, overprinting of soils and variable post-depositional preservation all result in the Quaternary record, whose unraveling requires multi-disciplinary efforts.

MAMMAL FAUNA OF LATE PLEISTOCENE IN SOUTH-WESTERN SIBERIA

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Upper Pleistocene in Western Siberia includes Kazantsevo, Ermakovo, Karga and Sartan climatic / stratigraphic horizons (correlated respectively with Mikulino, Lower, Middle and Upper Valdai of Eastern Europe). Kazantsevo and Karga correspond to warm epochs, whilst Ermakovo and Sartan correspond to cold epochs. Previously, Late Pleistocene mammal fauna of Western Siberia was linked only with «cold» horizons (Ermakovo and Sartan); there were no records of faunas corresponding to warm periods. As of now, the author has studied the Quaternary fauna of South-western Siberia in detail, tracing ecologically different lineages and establishing their successive development stages in the groups of Proboscideans and large ungulates. Obtained results as well as other data allow distinguishing of faunal groups that correspond not only to glacial, but also to interglacial horizons of Pleistocene chronostratigraphic scheme of Western Siberia (Foronova, 1999, 2001).

Interglacial faunas on the territory under study were not of a forest type. Due to continental climate and specific vegetation zoning they preserved steppe and forest-steppe guise, which hampers their recognition. Nevertheless they can be distinguished from periglacial faunas by absence of arctic elements, wider occurrence of forms connected with humid biotopes, as well as by specific morphofunctional adaptive features of tooth and limb bones with some forms. During the Kazantsevo Interglacial the territory under study was inhabited by: *C. lupus, U.* cf. *arctos, P. spelaea, E.* ex gr. *germanicus, Equus* sp., *C. antiquitatis, C. elaphus, M. giganteus, A. alces, B. priscus.* The most typical faunal elements are: wide-finger caballoid horse, various deers, and relatively thick-enamel *M. primigenius* of early form. Karga epoch is characterised by: *V. vulpes, P. spelaea, C. spelaea, E. przewalskii, E.* ex gr. *gallicus, Equus* sp. (aff. ? *hydruntinus*), *C. antiquitatis, C. elaphus, M. giganteus, A. alces, B. priscus, R. tarandus.* An advanced, conditionally thick-enamel *M. primigenius* (intermediate form) also corresponds to this stage. It was ^{14}C-dated from 45 220±1 700 to 28 870±60 yr. BP.

The faunas of cold epochs – Ermakovo and Sartan – characterise periglacial conditions and open landscapes. They differ from above mentioned (conditionally «warm») faunas by: presence of *M. primigenius* with «thin-enamel specialisation», occurrence of arctic elements, and predominance of graceful horses. Following forms occur in the sediments of the beginning of Würm: thin-enamel *M. primigenius* (intermediate form), *E.* aff. *taubachensis, Equus* sp., *C. antiquitatis, B. priscus.* In the end of Würm (Sartan Glacial) the territory was inhabited by: *C. lupus, U.* cf. *arctos, P. spelaea, Mustela* sp.*, E. przewalskii, E. hemionus, C. antiquitatis, C. elaphus, A. alces, R. tarandus, B. priscus, S.* cf. *borealis.* The most advanced *M. primigenius* was a typical representative of the fauna. It had extremely thin enamel (molar plate frequency: 9,4–10,6 on 100 mm; enamel thickness: 1,0–1,3 mm) and was perfectly adapted to consumption of periglacial vegetation.

BOUNDARIES IN QUATERNARY CHRONOSTRATIGRAPHY: THE THIN BLACK LINE

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The chronostratigraphy of the Quaternary System has been a topic of intensive discussion throughout the subject's history and remains so today. The extraordinary complexity of change during the period and the widely held desire to differentiate and correlate these changes across local areas, wide regions and ultimately the world are centrally important research goals. With the recognition of the detail represented in the ocean sediment and, more recently, the ice-core sequences, emphasis has been focused on attempts to identify and correlate ever smaller-scale events. This has offered an important challenge to stratigraphers working in all environments, to address the implications of high- or even ultra-high resolution sequences. But in this 'hot-house' atmosphere of rapid advance, stratigraphical concepts are becoming strained. In particular, the concept of the boundary within sequences of quasi-continuous change is one that requires careful consideration.

The need for precision in Pleistocene subdivision has long been recognised, particularly in Europe. By the early 1970s, stratigraphers saw the need to refine and formally-define the divisions of the Pleistocene driven by the increasing precision then being identified in terrestrial and ocean sediment records. Thus in 1973 an INQUA Working Group was established to examine the divisions of the Pleistocene with the primary objective of establishing boundaries for the Lower, Middle and Upper subseries of the Pleistocene Series. It was also intended "to define these boundaries on the basis of criteria that would allow them to be as time-parallel as possible throughout the world in both marine and continental sediments" (Richmond, 1996). These objectives have yet to be fully achieved.

The need to define boundaries in Pleistocene sequences is discussed. Although it may seem attractive to define primary chronostratigraphical reference boundaries in an ocean sediment sequence, the inherent imprecision of the majority of such sequences, resulting from slow sedimentation rate, combined with the effects of bioturbation, suggests that they are unsuitable for high-resolution stratigraphical purposes; particularly for the definition of 'golden spike'-type, 'time-plane' boundaries.

It is therefore proposed that the major boundaries (subseries, stage) should be defined from terrestrial or shallow marine boundary-stratotype localities. This should represent a priority task for the SEQS in the immediate future.

STRATIGRAPHY AND INTERREGIONAL CORRELATION OF THE PLEISTOCENE LOESS-PALEOSOL SEQUENCES OF CENTRAL AND EASTERN RUSSIAN PLAIN

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The results of the chronostratigraphic subdivision of the loess-palaeosol formation (LPF) of the East European Plain are presented. A correlation of basic palaeogeographical events of the loess areas in the Pleistocene has been carried out. It is shown that the period of the IPF development on the East European Plain comprises 17 palaeogeographic stages (9 interglacials and 8 glacials between them) – Petropavlovka interglacial (Interglacial 1, Waardenburg), Pokrovka cooling (Glacial A), Early Ilyinka interglacial (Interglacial 2, Westerhoven), Inter Ilyinka cooling (Glacial B, Unstratian), Late Ilyinka interglacial (Interglacial III, Rosmalen), Don glacial (glacial C), Muchkap interglacial (Belovezh, Interglacial IV, Noordbergum), Oka glacial (Elsterian), Likhvin s. str. interglacial (Holsteinian), Borisoglebsk glacial, Kamenka interglacial (Domnitz), Orchik cooling, Romny interglacial, Dnieper glacial (Saalian), Mikulino interglacial (Eemian), Valdai glacial (Weichselian) and the continuing Holocene interglacial.

Environment and vegetation evolution of the epochs of the loess and soil formation in the East-European loess province has been characterized by palaeosol data of the reference sections of the East European Plain: the Upper Don, Middle Volga, Upper Kama regions.

Complex studies of morphogenetic and geochemical properties of buried soils show expressive individual features of palaeosols of different geochronological stages of Pleistocene related to different types of ancient pedogenesis. They also show a similarity of typological features of so it formed during the same time intervals, and their regional differences connected with both geographical situation and geological-geomorphological conditions. These results enable to suggest that the soil formation during the Early Pleistocene was mainly followed subtropical type (meadow-chestnut, red-chestnut (chernozem-like), meadow-chernozem-like soils), during the Middle Pleistocene – subtropical and temperate type (brunizems, brown-forest-like and chestnut-like palaeosols), during the Late Pleistocene – of a frigid continental type. Interstadial soils of this period were characterized by humus accumulation and cryogenesis. Pedogenetic processes of a temperate type, similar to the modern one, characterized the Mikulino interglacial. Soils of forest and steppe types were widespread during this period.

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UPPER PLIOCENE AND TRANSITION TO THE PLEISTOCENE IN THE DON BASIN (RUSSIAN PLAIN)

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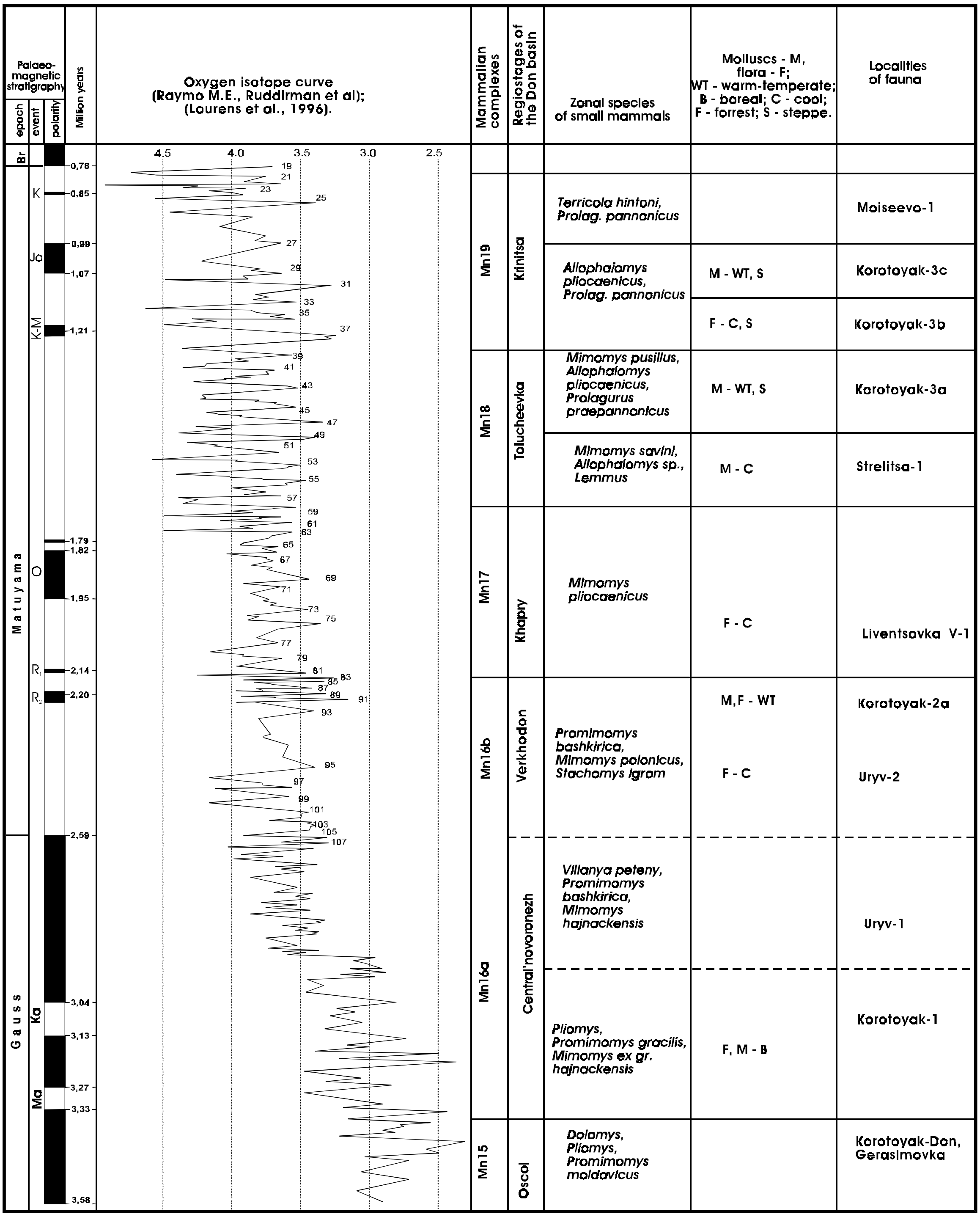

INQUA-SEQS 2002

MODERN TECTONO-SEISMIC ACTIVITY IN BASHKORTOSTAN

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Our investigation of various regions of the Earth (the Urals, East-European platform, the Crimea, Carpathians, Caucasus ets.) showed, that some Paleozoic, Mesozoic and Cenozoic geological structures are geologically active at present: their development is on nowadays.

So, some dislocation formed in the South Ural 400–150 million years ago is active nowadays. In points of cropping out on such dislocations one can see the ground deformation, intensification of gorge formation, karst show, land-slide show.

Now it is known, that most part of dislocations in the Earth's crust is represented by thrusts. In the course of thrusting the frontal parts of allochtonous bodies form systems of plicative folds so, there one can watch the arrangement of anticline ramparts along the thrusts on the side of their dippings. In conditions of lateral compression there formed a tectonic pair, thrust-fold which in any part of the planet should be considered as potentially seismic active. It is connected with long-life of thrust dislocations, with repeated periods of thrusting, with active role of the latter in rebuilding of structural plans. Here we can find the information about past geological events (seismic as well) and data, providing to forecasting the character of the Earth's crust development at present.

It is estimated now that earthquakes accompany anticlines growth in South California.

Seismic-tectonic investigations in the central part of Bashkortostan went on during 1991–93. Besides the structural analysis to estimate the fault component and tracing the faults in the open country, we watched the dynamic of the surface, cleared out the newest deformations shows.

In the areas of modern tectonic activity we made instrumental surveys.

High values of seismic noise in 1993 apparatus fixed in point's characteristic for frontal zones of thrusts. These are areas subjected to such exogenous factors as downfalls, landslides, gorge-formation etc.

On the map represented seismic noise levels distribution, seismic data of the Republic of Bashkortostan territory which is referred to East-European platform and Fore-Urals fore deep show that this territory is seismically active; zones of seismic-tectonic risk distribution are characterized by lineation, coinciding with the main structural elements of tectonics location.

NEW DATA ABOUT NEOGENE – EOPLEISTOCENE DEPOSITS IN THE SOUTHERN URALS HIGH PLATEAU

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In 1985–1987 yrs in process of research for gold placers in Southern Urals high plateau were obtained new data. First are found and mapped the fragments of watershed pebble stones in palaeo-valley of Zilair river, over 8 km long, palaeo-deposits of local troughs and a series of terraces having high levels (35–50 to 100–120 m over the river water level). Bared on complex geologic and geomorphologic investigation and using space-time correlations with stratified deposits in For-Ural region, witch is a source of detritus material and reflects the main phases of neotectonic development of Southern Urals high plateau, was constructed preliminary stratigraphic scheme.

The oldest from the investigated Cenozoic deposits in studied territory, watershed pebble stones in palaeo-valley of Zilair river, can be correlated with Naurzum suite of young-middle Miocene. They were deposited before main phase of neotectonic elevation of Zilair plateau (frontier of young Miocene and middle Pliocene). This is indicated by development of palaeo-valley of Zilair River, first located immediately along western foot of Ural-Tau ridge, with following migration, caused by ridge elevation, toward west for distance 5–6 km. It is indicated also by the maturity of sediments, filling the palaeo-valley, witch include multicolored plastic clays, composed from hydromicas (7–8%) and halloisite (40–45). 20–30% of sediments made pebble stones, containing pebble – sand material of quartz (89%) and quartzite (11%) composition, with middle roundness (K_r – 50%). In the heavy fraction dominate weathering-resistant minerals (chromite – 45%, ironoxydes – 30%, ilmenite – 5%, zircon – 1%.

Inside of Pliocene – Pleistocene valley on Zilair Plato the highest terraces VIII–XII (aN_2) are mapped in middle and upper parts of valley Krepostnoy Zilair and are erosional. Representative sections are found in VII, VI and V high basement terraces of Zilair, Krepostnoy Zilair and Kana. After predominated colors and lithologic and mineralogical peculiarities these terraces are named “white colored” (aN_2^3), “multi colored” (aE_I) and “brown colored” (aE_{II}).

Characteristic sections of alluvial deposits in “white colored” VII terrace (aN_2^3), good expressed in relief, are found in valleys of Zilair and Krepostnoy Zilair, with relative high marks, accordingly, 97 and 55 m. Upper part of section is composed from sands, quartzite, inequigranular, slightly clayey, ochre-brown and yellowish-white, with 20–50% of gravel-pebble material 1–1,4 m thick. Under them lay boulder pebble stones with sand-gravel matrix and pebble-gravel deposits 0,5–1,1 m thick. Composition of detritus includes quartz (75–78%) and quartzite (10–25%). Roundness is good (K_r – 58–59%). Clay components include montmorillonite (8%), pyrophyllite (30%) and hydromicas (35%). In heavy fraction in terrace deposits of river Zilair are represented: chromite (35%), epidote (23%), zircon (2%), rutile (2%); in deposits of river Krepostnoy Zilair – ilmenite (75%), brookite (11%), garnet (5%), rutile (2%).

In spore-pollen specters predominant are conifers, including (%): *Pinus* sect. *Eupitus* (9–12%), *P.* sect. *Cembra* (20–21%), *Pinus* sp. (30–47%). Deciduous forest – 10–26% of whole, including: *Betula* – 14–22, *Alnus* – 0,7–1,1, *Corylus* – 1,0–1,5, *Carpinus* – 0,3–0,5, *Quercus* – 0,4–0,7, *Tilia* – 0,7–1,4 and *Fraxinus* 0,5. Among the grasses (14–28%) are found: *Artemisia* – 2,7–2,8, Chenopodiaceae – 2,7, Compositae 1,3–5,8, Poaceae 1,3–4,0, Rosaceae 1,3–2,8, Ranunculaceae 0,7–1,0, Urticaceae 0,7–1,0; spores: Polypodiaceae 4%, Licopodiaceae 0,8%.

Alluvial deposits of “multi-colored” VI terrace (aE_I) are opened by prospect hole in sides of valleys Kana, Krepostnoy Zilair and Zilair rivers, with relative high over river niveaus accordingly 25, 35–40 and 90–100 m. Reddish-brown plastic clays with inclusions quartz pebbles and heavy weathered rocks fragments, 2,5–3,3 m thick represent them. Lower part of section-gravels tone and pebbles tone, with rare boulder of quartzites up to 0,4 m diameter, Matrix – sandy-clayey, reddish-brown, with greenish and blue stain. In places finds iron-manganese secondary concretion. Thickness – 0,8–1,2 m. Composition of gravel material – quartz (60–64%), quartzite (34–40%). Roundness is middle (K_r – 53–54%). Clay composition: montmorillonite and hydromica (87–89%), with halloisite admixture. In heavy fraction are represented ilmenite (7–32%), iron hydroxides (16–47%), epidote (5–36%), monazite (up to 4%), brookite (1–6%).

Spore-pollen specters from clay specimens contain pollen of conifers – 50–68%, including *Pinus* sp. (18,2–28,0), *P.* sect. *Eupitus* (14–17), *P.* sect. *Cembrae* (10–16), Picea (0,9); deciduous wood – 20–21%, including: *Betula* – 17–20, *Alnus* – 0,9–1, *Corylus* – 0,9, *Tilia* – 0,9–1,6, *Quercus* – 0,8–0,9; grasses – 10–28%, including: Poaceae – 1–3,5, Compositae – 1,8–4,0, Chenopodiaceae – 1,8–4,5, Ranunculaceae – 1,7–1,8, Polygonaceae – up to 27, Leguminosae – 0,9, Plantaginaceae – 0,9–1,8; spores: Polypodiacea – 1,8.

After position lower of “multicolored” terrace and higher of terraces stairway, belonging to lower levels of Neopleistocene, the alluvial deposits of “brown-colored” V terrace can be attributed to Later Eopleistocene (aE_{II}). They are opened by prospect hole on rivers Krepostnoi Zilair and Zilair and are composed from gravel (30%) – and pebble (40–45%) deposits with sandy-clay matrix yellowish-brown and light-brown in color, 1,7–1,9 m thick. In some places is observed admixture to 5–10% boulder material. Material of pebbles is represented by quartz (79–90%) and quartzite-sandstones (2–10%). Roundness was 52–58%. Heavy fraction composition: from Zilair river chromite – 53%, epidote – 38%, zircon – 1%; from Krepostnoy Zilair river: ilmenite 62%, epidote 5%, brookite – up to 15%.

Spore-pollen spectrum are represented by (%), coniferous: *Pinus* – 40–53 up to 77, *Abies* up to 1,5; deciduous wood: *Betula* – 12,8–33,9, *Corylus* – up to 2–3,1, *Tilia* – up to 1,3; grasses: *Artemisia* – 0,8–7,7, Compositae – 2,4–6,2, Chenopodiaceae – 1,3–6,2, Ranunculaceae – up to 0,8–1,3, Umbelliferae – 1,4–3,7, Leguminosae – 0,8–13,8.

Transition to the staircase of Neopleistocene terraces lower (I–IV) levels marked by a new deepening of river valleys. Their alluvial deposits have broad distribution and are good researched.

Analogous works, including research on high level terraces, are fulfilled in 1987–90 yrs, by Cenozoic detachment of OAO “Bashkir Geology”, with immediately participation of author, on eastern slope of Southern Urals, in basins of rivers Ui, Ural, Sakmara, Tanalyk. In reconstructed palaeo-valleys of these rivers are found and opened by prospect hole from 4 to 8 preNeopleistocene terraces.

The data obtained permitted better understanding of geological-geomorphological evolution of Southern Urals and genesis and conservation of Neogene–Quaternary gold placers.

RECENT STRESS FIELD OF THE SOUTHERN URALS, BASED ON THE MESOTECTONIC STUDIES

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The synchronous uplifting of the recent Urals and the orogenesis in the adjacent part of the Alpine-Himalayas belt suggest that the Urals' formation was connected in some extent with collision events within the latter. It is characteristic that the South Urals neighboring the zone of dynamic influence of the collisional area grew especially fast. To examine this idea, we carried out neotectonic investigation of the South Urals to find out inadequately studied horizontal component of the neotectonic block movements. The following methodics were used: (1) analysis of morphology and kinematics of folds formed by the Upper Mesozoic and Cenozoic beds, (2) definition of morphostructural pattern of the recent relief, and (3) field mesotectonic observations of the Upper Mesozoic – Cenozoic rocks.

In **the Tanalyk-Baimak trough** of the Late Mesozoic – Paleogene age confined to the Paleozoic ophiolite zone of the median South Urals, higher crumpling of the Jurassic – Eocene sediments prior to the formation of the Pliocene planed surface was found out. The folds of the SW–NE orientation were truncated in the east by the post-Eocene Novokievka overthrust, a well-known feature revealed by drilling. Judging by sign of the folds en echelon arrangement, this meridional fault has a sinistral component of wall displacement. This kinematics of the fault was also confirmed by slickenside measurements. The Neogene – Quaternary molasses of the **Beloretsk intermountain basin** imposed on the Uraltau unit of crystalline rocks are less deformed, but also slightly crumbled together with roof of the Paleozoic basement into gentle folds. Mesostructures are represented by normal and strike-slip faults as well as breakaway fractures located at the top of the sequence and filled by lime nodules. They all were formed under submeridional extension. To the west the next strip of the Cenozoic rocks, which are mostly composed by a coal-bearing series of the Oligocene-Miocene age, is confined to axial part of **the Belaya segment of the Uralian foredeep**. These rocks are crumbled into steep folds and disrupted by minor thrusts and strike-slip faults formed in the Late Miocene – Eopleistocene time. They constitute en echelonically arranged series suggesting a meridional dextral shear along the foredeep axis. The mesotectonic studies show that a main shortening axis of the deformation ellipsoid is oriented across the folds. This confirms a view about compressional origin of the latter's as well as about a dextral shear along the axis of the Uralian foredeep. In **the Aktyubinsk Cis-Urals** situated between the Urals and the Paleozoic Caspian syneclise, deformation of the Jurassic-Cretaceous strata was related to halotectonics associated with general horizontal compression. The neotectonic structure of this region has a block character and, besides being complicated toward the Urals, is controlled by a series of sublatitudinal normal faults with a strike-slip component presented in a northern border of Pliocene-Quaternary Caspian basin. Mesotectonic observations indicate general turn of main axes of the deformation ellipsoid from the west to the east; the shortening axis rotating from submeridional to sublatitudinal orientation and the lengthening axis rotating from sublatitudinal to northwestward and locally meridional orientation.

Summary. The collected material allows the conclusion that the recent deformation of the South Urals occurred under sublatitudinal compression almost transverse to its trend and/or longitudinal, submeridional extension. The compression was concentrated at the Jurassic-Cenozoic troughs serving as zones of weakness during the Alpine orogeny. In contrary, the Alpine stresses relaxed into extension where they affected the rigid metamorphic rocks of the Uraltau unit (true, the extension was directed approximately to S–N, i.e. along the recent Urals, hence it is compatible with sublatitudinal compression of the latter). Such a selectivity of compression or extension depending on rheology of rocks can be explained only by external position of sources of stresses which, in our opinion, were caused by collision of the East European craton with frontal blocks of the Peri-Arabian and Peri-Indian collisional areas. The participation of the first collisional area is proved by the above-mentioned gradual turn of main axis of shortening from the meridional ("the Caucasian") to SW–NE and then up to latitudinal ("the Uralian") orientation eastward. The turn is fixed in the Aktyubinsk Cis-Urals. Sublatitudinal compression across the Urals was accompanied by a shear longitudinal or slightly oblique to the latter.

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MEGA-MAMMALS OF THE LATE PLIOCENE AND PLEISTOCENE (SOUTHERN URALS)

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Bone remains of mega-mammals have been found in alluvial, lacustrine, and cave deposits, as well as in archaeological sites. Only few separate bones usually occur in alluvial and lake sediments, and mainly not *in situ*. Abundant fossil remains of animals were found in some cave and archaeological sites.

Faunal communities dated to the late Pliocene, Eopleistocene, early and middle Neo-Pleistocene time are represented by separate finds identified to: Tragelaphini gen., *Dicerorhinus kirchbergensis* (Jaeger, 1839); *Cervalces latifrons* (Johnson, 1874); *Bison* cf. *schoetensacki* (Freudenberg, 1910); *Elasmotherium sibiricum* (Fischer, 1808).

Bone remains of elephants referred to the mammoth line are more abundant. There are known several finds of *Mammuthus meridionalis* (Nesti, 1825), *M. trogontherii* (Pohlig, 1885), and early form of *Mammuthus primigenius* (Blum., 1799). There is one site dated to the terminal middle Neo-Pleistocene, in the Ignatievsky cave (pit V, layer 9). Bone remains from it were identified to: *Lepus* sp., *Marmota* cf. *bobac, Canis lupus* (small form), *Alopex lagopus, Vulpes vulpes, Ursus* cf. *rossicus, Gulo gulo* (small form), *Coelodonta antiquitatis, Cervus elaphus, Rangifer tarandus, Bison priscus.*

The mammoth (late) faunal complex is represented in the major part of sites. Several dozens of alluvial and cave sites including this type of the fauna are known. Two variants of this mammalian complex have been described, one of them corresponding to the Leningrad interstadial, and another one – to the Late-Valdai (Ostashkovo) glacial time; the two variants differ by the species composition and percentage of some animals represented.

During the whole time span when this complex existed, it included the following animal species: *Lepus tanaiticus, Marmota bobac, Canis lupus* (large form), *Alopex lagopus, Vulpes vulpes, Ursus spelaeus, Martes martes, Gulo gulo* (large form), *Mustela erminea, M. nivalis, M. eversmanni, Pantera spelaea, Mammuthus primigenius* (late form), *Coelodonta antiquitatis, Alces alces, Rangifer tarandus, Bison priscus, Saiga tatarica*. During the Leningrad interstade, complex of mega-mammals included also: *Castor fiber, Vulpes corsac, Crocuta spelaea, Camellus ferus, Cervus elaphus, Megaloceros giganteus, Bos primigenius, Ovis ammon*, the horse was represented by *Equus* cf. *latipes*. All these species are not found in the sediments of the Ostashkovo glacial, and the horse remains of the period are identified to *Equus uralensis*. Sediments corresponding to the interstadial, contained more bones of the marmot, fox, and rhinoceros. The main alluvial site representing the interstadial fauna of mammals is the site of Gornova. No alluvial sites demonstrating the full-value glacial faunas are known in the region. The main cave sites presenting the interstadial fauna are the following: Ignatievsky cave (pit V, layers 2–8); the cave Sikiyaz-Tamak–7 (layers 11–15); Zhemchuzhnaya cave; Ust'-Katav cave. The main cave sites presenting the glacial fauna variant are the caves Serpievsky–I (layer 2), Nikolsky cave (layer 2). Holocene-dated fauna assemblages are known from 40 archaeological sites and from 15 cave sites.

Two stages in the development of mammalian fauna were distinguished for the elevated regions. Thus, during the early and middle Holocene there, *Capreolus pygargus* was registered to dominate among the hoofed animals, whereas since the late Holocene and recently *Alces alces* showed dominance.

The first domestic animals, *Bos taurus, Ovis aries* and *Carpa hircus*, were marked at the end of the Neolithic time (Atlanticum 2–3), probably borrowed from elsewhere.

NOVOBELOKATAJ PALAELITHIC SITE IN THE NORTHEAST OF BASHKORTOSTAN

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The site is situated in the center of the Novobelokataj village of the Belokataj (North-East of Bashkortostan) district at the base of a 16 meters steep left bank of the Big Ik river. K. Salnikov in 1964 excavated this site at an area of 37 m^2 (Salnikov, 1964). In the years of 1995–1996 the investigations had been resumed of the present article's author, the unearthed area being 48 m^2 (Kotov, 1996). Our research has confirmed the stratigraphy revealed by the preceding investigator: the grey and blue loamy soil is deposited at the base of brown loams at a depth of 15 meters, in the upper section of the former there is a bed stratum of boggy deposits that are turned into humus. The stratum has been washed away by aquatic flows. This is marked by a greenish metal-like landy loam and by strata of light loam, which is green graying. The lateral walls demonstrate a sharp incidence of strata closer to the river. The coastal washout of deposits observed by the stratification is also revealed in the objects having a vertical scatter of almost 1 m in the cultural horizon, at the same time they have not been subjected to significant dislocation in the horizontal plane. Some bones and thin slabs of stone are found to be awry and in a vertical position. Thus, the bone accumulation and vestiges of a dwelling area are timed to ancient riverbed accumulations. Lake situation was typical for relatively simultaneous sits Gornova on the Belaya river and Pescherniy Log on the Chusovaja river (Salnikov, 1964).

The overwhelming majority of the finds are composed of bones of various Pleistocene animals. As defined by P. Kosintsev (Ekaterinburg) and A. Kasparov (St. Petersburg) most bones belong to the bison, more rarely one can meet vestiges of the horse, wooly rhinoceros, the giant deer, the noble deer, hare, marmot, dog and the boar. Scorched and cleft bones are also encountered. The memorial's peculiarity is the presence of bone tools: perforators for hides, scrapers, bone knives, tools that could be used for sawing (?) manufactured out of scorched mandibles of a dog, a couple of baked antlers of a roe deer were used as abradants for hides processing. Besides, one can refer to bone artifacts a fragment of elk cranium or that of a giant deer with traces of a horn cut off at its base, a deer horn fragment with traces of scraping and a bison's horn cut off a scull.

Some massive bone chips and a rhinoceros's large bone with epiphytes removed by sealing and a bone cavity dug out employed as a "nucleus" for splitting off chips also belong here. The stone artifacts collection is represented by a couple of quartzite chips, two choppers, a dolomite scraper and a shingle pre-nucleus. Some small and large coals are encountered in the deposits of the gray and blue loam and the humus inter layer. A congregation of small coals having a ^{14}C date of 41070 ± 1570 years (LU 4149) (Danukalova, Yakovlev, Kotov, 2000) has been discovered rehash are vestiges of a washed-out fireplace. The archaic shape of stone utensils and presence of coarse bone tools allow us to refer this relic to the well-developed Moustier age, which coincides also with the absolute dating.

GEOLOGY AND RADIOCARBON AGE OF THE MAIN CULTURAL LAYER OF THE UPPER PALAEOLITHIC SITE KAMENNAYA BALKA II (LOWER DON RIVER)

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The Upper Paleolithic site Kamennaya Balka II (KB II) is situating on the upper part of the right slope of the ravine Kamennaya Balka, which is falling into Don-river valley, in the district of its delta (The northern coast of the Azov Sea). The covered thickness consists of green, red-grayish-brown clays and brown-brown loams, which are dating, according spore-pollen analysis (conducted by E. A. Spiridonova), as the middle Valdai, and pale and pale-grayish-brown loss loams, which dating, by the same way, as the latest Valdai.

The pale loss loams are including the main (second) cultural layer of the site KBII, which according the archaeological data and radiocarbon dates undoubtedly belongs to the last Valdai. To the moment, this layer has about 15 radiocarbon dates in interval from 13 to 15,7 thousands years BP. The long interval between these dates, apparently, has been caused the differences of the methods used various laboratories and the quality of the material of the samples. Our samples were working in the several laboratories – Radiocarbon Laboratory University of Groningen (GrA), Radiocarbon Laboratory of the University of Arizona (AA), Institute of Geology RAN (GIN), Illinois Geological Survey of the University of Illinois (IS) and ets. The good examples are the dates from table – the dates 14330±150 (Ki–82125) and 15610±80 (GrA 18349) had been received from the samples which practical were taken from the same place. It’s mean that the most reliable dates are in interval from 14,5 to 15,5 thousands years BP.

The last in the time dates were received from Kiev radiocarbon Laboratory of the Institute of Environmental Geochemistry of National Academy of Sciences of Ukraine. They had been got from bone coal out of the cultural layer and some preparations of the humic acids, which had been selected from buried soil under this cultural layer. The main cultural layer was formed on the surface of the buried pioneer soil and had been destroyed it very strong – there are only some humus fissures were preserved on the several portions of the site. The sample for the radiocarbon dating had been taken from these fissures.

In the table there are the new unpublished dates, which were received from two different laboratories in 2001 year.

Name and NN of the sections	Layer, soil, horizon	Deep, cm.	Dating material	Laboratory number	Age ^{14}C BP
KB–II / 99	KL–2, humus fissures	150	H. soil	Ki–8215	14750±150
KBII / 01	KL–2		Bone coal	Ki–9379	14330±150
KBII / E–7	KL–2		–«–	GrA17961	14730±70
KBII / D–7	KL–2		–«–	GrA17964	14850±80
KBII / B–8	KL–2		–«–	GrA17957	15590±80
KBII / D–6	KL–2		–«–	GrA18349	15610±80

All mentioned above radiocarbon dating permit us to firmly establish the most reliable time interval for forming of the main cultural layer as the from 14,3 to 15,6 thousand years BP. But, all means, the real duration of the forming of this cultural layer was much shorter.

LATE PLIOCENE – MIDDLE PLEISTOCENE LARGE MAMMALIAN FAUNAS OF UKRAINE AND NEIGHBOURING TERRITORIES

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The intensive study of the Late Pliocene and Pleistocene mammalian faunas throughout Ukraine during the last decade permits the revision of the systematic composition. The data on the faunal successions of the Ukraine are very useful for better understanding the evolution, dispersal of faunas and Eurasian correlation. In addition to published data, we used new results, which were obtained by the revision of collections stored in the National Museum of Natural History of the NAS of Ukraine, Regional Museums of the Zaporizhzhya, Rostova, Azova and Palaeontological Museum of the Odessa Natural University.

Large localities of the Late Pliocene: Kotlovyna (middle and late levels), Dolyns`ke, Cherevychne (middle level), Tokmak, Velyka Kamyshevaha, Reny.

The most typical large mammals are *Archidiskodon meridionalis* and *Equus* (*Allohippus*) *stenonis*. These faunas are also characterized of *Anancus arvernensis*, *Hipparion* sp., *Equus* (*A.*) *livenzovensis*, *Stephanorhinus etruscus*, *Elasmotherium caucasicum*, *Paracamelus alutensis*, *Eucladoceros* cf. *tetraseros*, *E. orientalis*, *Gazellospira* cf. *gromovae*, *Gazella* sp., first *Bison* (*Eobison*). The Villafranchian faunas of Ukraine differ from the contemporaneous faunas of the Mediterranean area in the presence of some forms of Asiatic origin (such as *Elasmotherium* and *Bison*) and some endemics. Together with elephants and horses, other inhabitants of open landscapes, such as *Elasmotherium*, camels and gazelles, were dominant. They co-existed with woodland inhabitants (mastodons, deers) and other mammals.

Large localities of the Early Pleistocene: Cherevychne (late level), Kayry, Nogays`k, Tarhankut, Chortkiv, Zhevahova gora (late level).

The fauna is characterized of *Archidiskodon meridionalis tamanensis*, *Equus* (*A.*) aff. *süssenbornensis*, genus *Stephanorhinus*, *Elasmotherium caucasicum*, *Paracamelus alutensis*, *Gazella* sp., *Pontocerus ambiquus*, *Bison* (*Eobison*) *tamanensis*. These faunas are similar to Villafranchian faunas of Ukraine.

Reference localities of the Middle Pleistocene: Morozivka, Tyhonivka, Bilaivka, Medzhydozh.

The faunas are characterized by the co-existed of large caballoid (*Equus mosbachensis*) and allohippusoid (*Equus süssenbornensis*) horses. Among other forms, the faunas of the Northern Black Sea area contain elephants *Mammuthus trogontherii,* rhinoceroses *Stephanorhinus merki* and *S.* ex gr. *etruscus*, deers *Cervus* ex gr. *elaphus*, *Praemegaceros verticornis*, *Pradama süssenbornensis*, *and Alces latifrons*. There are also characterized of *Bison* aff. (*Bison*) *schoetensacki*.

The data on faunas from the territory of the Ukraine fill a gap between faunal sequences of the Mediterranean area and Asian region. The main renewals of mammalian faunas occurred at the Pliocene / Pleistocene and Early/Middle Pleistocene boundaries. They resulted from global cooling which led to fundamental changes of palaeoenvironment.

BIOGEOGRAPHICAL PROVINCES OF THE RUSSIAN PLAIN DURING THE LAST GLACIAL MAXIMUM (24,000–17,000 yr. B.P.)

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The Late Valdai ice sheet began to advance after Middle Valdai Bryansk Interstade (33,000–24,000 yr. B.P.). Numerous data suggest the period between 24,000 and 17,000 yr. B.P. being the coldest during the Pleistocene. The southern limit of the ice sheet during the Last Glacial Maximum (LGM) was located along Valdai Highlands and receded northwards farther east (Velichko, Kononov, and Faustova, 2000).

For the first time an attempt has been made to reconstruct biogeographical provinces of the Russian Plain at the LGM on the basis of integrated analysis of data on mammals and plants.

Fifty-five LGM mammal localities including 71 taxa and 54 sections with pollen records have been discovered in the recent years from the Russian Plain deposits. Most of these sites are dated by ^{14}C. These materials were organized in the database software PARADOX and then moved to the GIS program ARC/INFO. The series of maps of mammal and plant ranges have been constructed for the LGM. They show a strong reorganization of these ranges under climatic changes. The majority of northern subarctic plant and mammal species penetrated southward to the lower Dniester drainage basin and central Russian Plain, whereas steppe species migrated farther north and west. Some forest species have also been recovered, but their distribution shows that no continuous forest zone existed at that time. The forest mammals of the broadleaf forests practically disappeared then from the Russian Plain and survived only in mountain and upland regions with numerous local habitats. The composition of LGM mammalian and plant communities shows that all the species have responded to climatic conditions in a Gleasonian manner. Species dispersed in different directions and on different scales what influenced the appearance of radically new communities and biomes.

Mathematic methods (principal component analysis, factor analysis, multidimensional scaling, claster analysis, *etc.)* also were used for the analysis of the palaeobiological materials. First, all the localities were classified by mammalian and botanical composition. Lists of mammals were established for each class of localities. These methods permitted to distinguish two principal groups of mammals (I and II), which include three subgroups each, different in the species composition. Pollen records also were analyzed using similar approaches. Three main groups of plant communities (I, II and III) have been distinguished on the Russian Plain. Each of them includes two subgroups with specific plant composition. The results of this classification were analyzed in artificial multidimensional space (MDS), as well as in geographical space according the latitude and longitude. Second, limits of biogeographical regions were defined on the basis of joint analysis of mammals and plants, and with special attention to the geographical position of all the site groups.

Joint analysis of mammal and plant data permitted to reconstruct the biomes on the territory of the Russian Plain during LGM. Analogues of modern natural zones did not exist at this time on the Russian Plain. The landscapes reflected the cold continental climate of this period. At least four biogeographical provinces have been established from north to south on the Russian Plain during LGM on the basis of joint analysis of mammalian and botanical data. The pollen data suggest a combination of **tundra and periglacial tundra-steppe communities** with *Selaginella selaginoides, Alnaster fruticosus* and tundra Lycopodiaceae, *Ephedra,* Chenopodiaceae with "islands" of pine-birch forests existed near the ice sheet. *Mammuthus primigenius, Bos primigenius, Ovibos moschatus, Rangifer tarandus, Clethrionomys glareolus, Dicrostonyx gulielmi, Lemmus sibiricus, Microtus gregalis, M. agrestis, Lagurus lagurus* and others were inhabitants in this belt; the mammal composition supports the plant data. The southern limit of this biome passed along 52°N in the west part of the Russian Plain and about 56°N in the Volga drainage basin.

South of it (up to ~ 49–54°N) the **periglacial tundra-forest-steppe landscapes** with pine-birch-spruce areas were distributed. The high diversity of mammals has been found here. Woolly mammoth, woolly rhinoceros, *Bison priscus, Bos primigenius, Ovibos moschatus, Equus, Saiga tatarica, Cervus elaphus, Capreolus capreolus, Rangifer tarandus, Dicrostonyx gulielmi, Lemmus sibiricus, Allactaga major, Ellobius talpinus, Clethrionomys glareolus, Lagurus lagurus, Eolagurus luteus, Microtus gregalis, M. agrestis, M. arvalis* were common.

Periglacial forbs and meadow steppes (combination of steppe vegetation with *Artemisia,* Poaceae, and Chenopodiaceae, and with low proportion of tundra plants). The mammal diversity began to lower here. *Mammuthus primigenius, Coelodonta antiquitatis*, *Bison priscus, Bos primigenius, Equus, Saiga tatarica, Cervus elaphus, Capreolus capreolus, Rangifer tarandus, Spermophilus, Allactaga major, Spalax, Cricetus, Eolagurus, Lagurus* and others were typical for this biome. This biogeographical province was distributed as far south as ~47°N on the.

Dry steppes and semideserts were reconstructed at the extreme south of the Russian Plain. Chenopodiaceae prevailed in the plant communities. A great amount of steppe and semi-desert mammals inhabited these areas.

The **refuges** of arboreal vegetation were located in the mountains and uplands during LGM, which can be attributed to high diversity of local habitats there. On the northern Russian Plain they included north-taiga (spruce-pine) communities; in the central and southern Russian Plain and in the Crimea they included *Betula-Pine* forests with some broadleaved plants. The pine forests occurred on the Donetsk Kriazh uplands as suggested by pollen records. The materials of the Crimean sites revealed high mammalian diversity, though mammoth remains have not been found here.

The principal biogeographical provinces of the Russian Plain during Late Glacial Maximum have been reconstructed for the first time by the joint mammalian and palaeobotanical materials.

150,000 YEARS OF CLIMATIC RECORDED IN THE LOESS SEQUENCE AT MIŠELUK (VOJVODINA, YUGOSLAVIA)

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The Mišeluk loess section is situated on the central part of north slopes of the Fruљka Gora Mountains. In this area loess covers a fossil landslide and mantles the alluvial plane of the Danube River. Geographical coordinates of the Mišeluk site are 45° 16' N Latitude and 19° 52' E Longitude. The approximately 6m thick Mišeluk profile formed during the last ca. 150,000 year and includes 2 loess layers, SL L1 and SL L2 (only upper part), separated by 1 fossil soil, SL S1.

Amino acid geochronology provides stratigraphic correlations between loess units SL L1 and SL L2 at Mišeluk with loess of glacial cycles B and C, respectively, at the nearby Ruma section and at other central European localities.

Variability of clay content in Mišeluk loess-palaeosol sequence shows similar fluctuations to the GRIP palaeoclimate record as well as other western European loess sites. This correspondence suggests a stronger Atlantic climatic influence recorded in the Mišeluk loess-palaeosol sequence than in other sections of the southeastern part of the Carpathian (Pannonian) Basin (fig.).

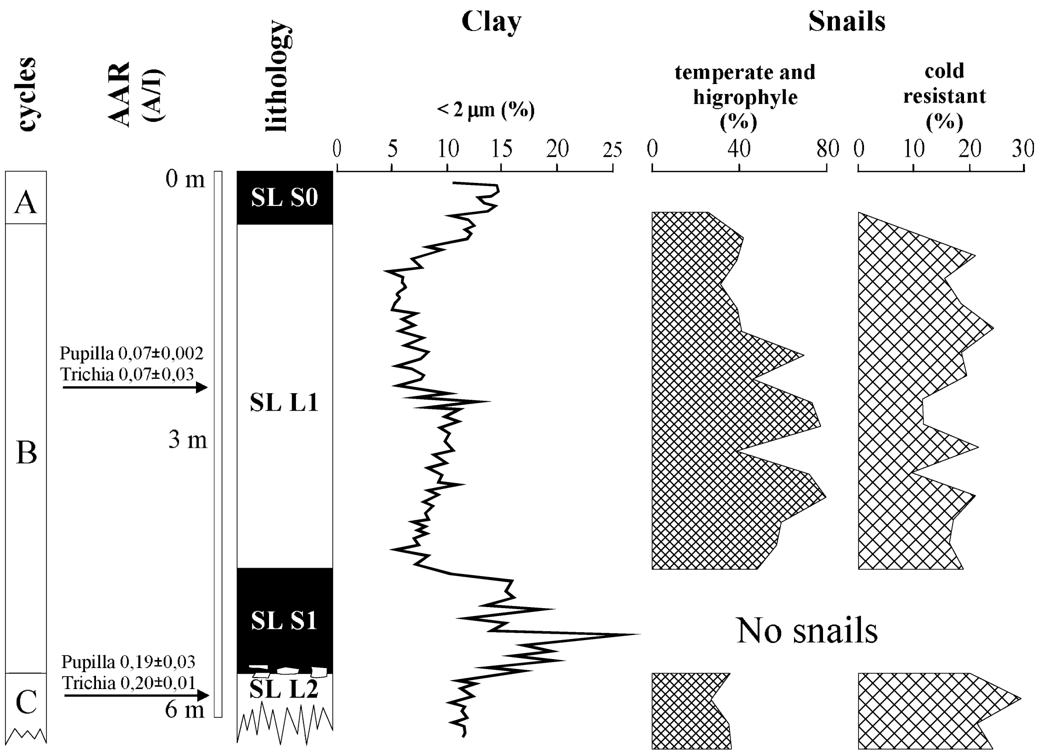

Fig. The Mišeluk section: Amino acid geochronology (A/I = Alloisoleucine /Isoleucine ratios), lithology, clay particle variations and gastropod fauna

Fossil land snail assemblages preserved in loess also indicate the dominance of hygrophilous and shade loving species which suggest a relative humid palaeoclimate compared to conditions interpreted from sediments elsewhere in the southern part of Carpathian (Pannonian) Basin. Malacofauna of Mišeluk site included species as *Aegopinella ressmanni*, *Macrogastra ventricosa* and *Ena montana* in loess below and above palaeosol SL S1, it demonstrates a significant similarities to the Paleopreillyrian refugial fauna of south Transdanubia region in Hungary, which suggests that Mišeluk has a refugial character during the periods of loess accumulation. Increasing of the total mollusk number and presence of *Granaria frumentum* suggests a warmer period in the middle of SL L1, probably corresponding to MIS (marine oxygen-isotope stage) 3. The strongly developed forest soil SL S1 further indicates humid and not so cold palaeoclimatic conditions during the last interglacial period.

MAGNETOSTRATIGRAPHY OF THE STARI SLANKAMEN LOESS-PALEOSOL SEQUENCE (VOJVODINA, YUGOSLAVIA)

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The Stari Slankamen section is located in the eastern part of the Srem Loess Plateau on the right bank of the Danube river opposite the Tisa (Tisza) river junction. The approximately 40-m thick steep cliff is built of loess intercalated with 10 pedocomplexes. According to previous investigations, the loess exposure in Stari Slankamen is considered as one of the most important sections in the Carpathian (Pannonian) basin. The significance of this section has also been elucidated and emphasized during our investigation.

A number of 59 oriented samples was collected for paleomagnetical analysis and measured in the Zürich GMA laboratory. The characteristic remnant magnetization obtained after alternating field demagnetization gives evidence of the Matuyama–Brunhes boundary (MBB) at a profile depth of about 36 m in the lower part of the oldest exposed loess layer. The apparent directional scatter around the MBB is probably due to Brunhes normal polarity overprint, which could not be removed by AF cleaning. Detailed magnetic low field susceptibility measurements were realized in the field for the lower part of the exposure and in the Lamont-Doherty Geophysics laboratory in Palisades for the upper loess-palaeosol sequences (Markovich and Kukla, 1999). The Stari Slankamen magnetic susceptibility record provides possibilities for correlation with key sections in Central Europe, Chinese loess sites and the marine oxygen isotope (MIS) stratigraphy. The new magnitostratigraphy results suggest serious revision of hitherto chronostratigraphic subdivisions and establish this exposure as a key loess section in Central Europe. Earlier age estimations, including thermoluminescence determinations, have to be revised, especially in the lower part of the section (Tabl.).

Table. Chronostratigraphy models of the Stari Slankamen loess-palaeosol sequence

Bronger (1976)	Singhvi et al. (1989)	Bronger & Heinkele (1989)	Zeremski et al. (1991)	Present model Lithodivision	MIS
				SL L1 SS1	3
F2 W2 – W3	5a	5a		SL S1	5
F3 W1 – W2	5e	5e		SL S2	7
F4 R –W			5	SL S3	9
F5		9 or 11	5	SL S4	11
F6		13–15	7	SL S5	13–15
F7			9	SL S6	17
F8			9	SL L7 SS1	18.3
F9				SL S7 SS1	19.1
F10				SL S7 SS2	19.3
F11				SL S8	21

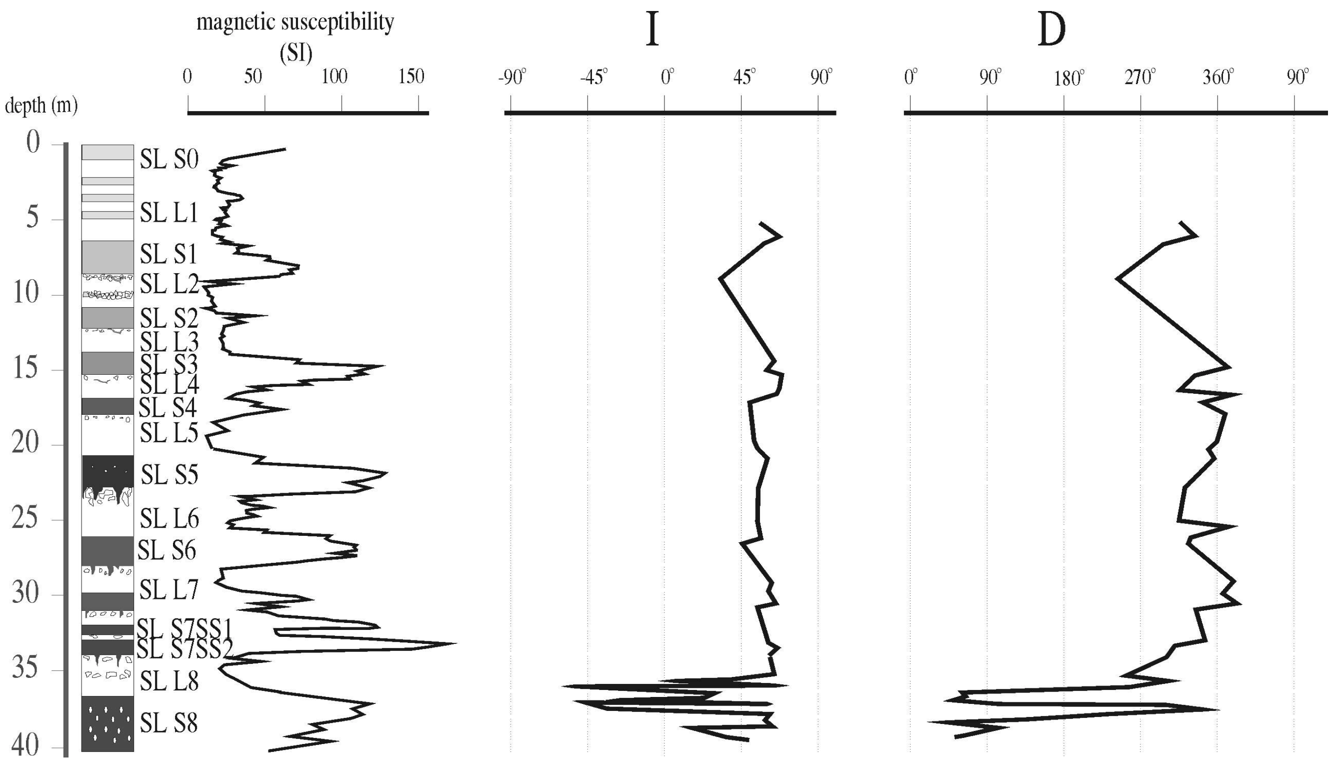

Fig. Magnetostratigraphy of Stari Slankamen loess-palaeosol exposure

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TRANSFORMATIONS OF THE FLUVIAL DRAINAGE SYSTEM IN POLAND DURING THE PLEISTOCENE

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Geological setting and regional peculiarities of the Pleistocene fluvial sediments in the southern peribaltic area take on special significance for understanding of the Baltic Sea drainage pattern development. Most of mid-eastern Poland has not been occupied by the Scandinavian ice sheets since the end of the Wartanian but this territory has been predominated later by repeated episodes of fluvial and glaciofluvial erosion and accumulation. At present many main rivers of the Polish Lowland pass across this very area and an important hydrographic junction occurs to the north of Warsaw.

Most valuable information on the Pleistocene fluvial sediments has been collected during the many years' systematic geological mapping of the country. These data have been used only occasionally for palaeogeographical reconstructions. Much detailed information was also available both in regional monographs and short communications.

The foundations of the modern drainage system of central Poland were laid already during the Holsteinian. In spite of occupation of this area by ice sheets of the Middle Polish Glaciations (Saalian) and general glacial modelling of the land surface at the termination of the Wartanian, main features of the Holsteinian river network were renewed during the Eemian and the interglacial fluvial watersheds were located again and almost in the same place. During the Weichselian the Middle Vistula valley was filled at first with widespread ice-dam deposition. The inherited pattern of interglacial fluvial deposition was interrupted rapidly in this very area. Then the runoff was deflected to the west due to rising base level of erosion and development of the Central European spillways.

The Pleistocene history of central Poland indicates that the present confluence of the Vistula, Narew, Bug and Wkra to the north of Warsaw has been for long an important hydrographic junction in Central Europe. The Holsteinian river network arose primarily from residual overflow lakes and the connecting channels, formed at the end of the Elsterian due to catastrophic runoff from the ice-dam lakes. The Holsteinian buried valleys are not fully reflected by the Eemian ones, because the latter resemble a fluvioperiglacial drainage system rather, developed already at the end of the Wartanian.

Presented transformations of the fluvial network in central Poland during the Middle and Late Pleistocene are based on the most complete and critical review of the published and archival data. Main river valleys were reconstructed for Holsteinian, Eemian and Weichselian. The area occupied by the interglacial seas in the southern Baltic basin resembled much the present Baltic Sea and therefore, the level of the Holstein and Eemian seas in the Baltic Basin was the main driving force for river system development. It made interglacial fluvial patterns is roughly similar to the contemporary one in central Poland and the main fluvial watersheds have been only slightly modified since that time.

Outside the areas with undoubted glaciotectonic deformations or neotectonic movements, beds of interglacial river valleys are located at similar altitudes or slightly beneath the beds of the contemporary rivers in this area. Therefore, lack of reliable dating methods makes river beds be the most important index to determine base level of erosion i.e. water levels of the Holstein and the Eemian seas.

Basing on setting of the Pleistocene river beds in central Poland, the reconstructed Holstein sea level seems to have been slightly lower and the Eemian sea level was very close to the present water level of the Baltic Sea. However, due to more southward extension of a sea, both during the Holsteinian as well as the Eemian, the interglacial river beds in central Poland are located well beneath the Holocene alluvia.

MAMMUTHUS PRIMIGENIUS FROM SEVSK LOCALITY (CENTRAL RUSSIA): SOME MORPHOLOGICAL AND ETHOLOGICAL FEATURES AS INDICATORS OF THE LATE PLEISTOCENE CLIMATE

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Despite more than two hundred years of study of extinct proboscides, and *Mammuthus primigenius* Blum. in particular, there is still great interest and a good deal of research aimed at solving ambiguity in interpretations of fossil data, and understanding its implications for the historical and individual development of this genus, as well as for its ecology and behaviour.

There are many mammoth localities known worldwide. The remains of relatively small species of woolly mammoth, *Mammuthus primigenius*, are known from the Late Pleistocene of Europe, Asia and Northern America, but it seems to have been limited to the northern regions of the Continent or near the glacial borders. The majority of these localities were mainly formed over a lengthy period of time and quite often are assembled from redeposited material.

The recently discovered and excavated recently Late Pleistocene Sevsk locality (Bryansk region, Central Russia) differs from others localities in Russia and West Europe in providing a natural accumulation of mammoth bones. It appears to be one of the largest of this kind in so far. In field seasons 1989–1991 the author obtained unique material during the excavation of numerous bones of woolly mammoths belonging to 33–34 individuals. The specific features of taphonomy (completeness, orientation, lack of distortion, the predominance of mammoth bones 4, 000 against 5 from other mammals and excellence in preservation), of sedementology (80% of the bone material was recovered from a layer of homogenous river sand representing one cycle of deposition) and as well as of the age and sexual composition of material (45% – subadults, including 2 new-born calves, and 1, 3–4 and 6–7 years old individuals; about 55% mammoth cows different individual ages) gave evidence of an abrupt mass-death. Radiocarbon data indicates, that mass-death took place about 14, 000 y. ago (13, 950±70; 13 680±60). This data indicate, that *M. primigenius* from Sevsk is the latest representatives of this genus in Central Russia. Possibly, because of a flood or as an accident while crossing a river on thin ice in the springtime. The taphonomy and specific morphological features (there are particular openings on the vertebrae, representing genetic features, characteristic only for relatives) allows the documentation, for the first time, of the family group (5 complete skeletons of calves along with 8 skeletal remains of adults) within a heard of *M. primigenius*. The woolly mammoths from Sevsk are the smallest in size of mammoth population in Eurasia mainland. The largest adult individual is 2.35 m in shoulder only, and the smallest one is about 1.8 m in shoulder. On the basis of this unique series of skeletons the author is conducting a study on the late stages of prenatal and early stages of postnatal periods of ontogeny of the woolly mammoth, to establish size – related characteristics for groups of different age and to identify specific characters of growth. This study shows, for example, that the newborn calves from Central Russia were not as toll, as in *Elephas maximus* L. and *Loxodonta africana* Blum., but became more equal in size toward the end of the first year of life. This characteristic was conditioned by replacement morphology in individuals of a wide age range shows a mechanism specific only for *M. primigenius*. It was conditioned by an adaptation to the diet of a hard grassy vegetation of a particular climate zone of the “tundra-steppes” during the Late Pleistocene, to which the area of migration of this genus became restricted. The study of *M. primigenius* from the Late Pleistocene Sevsk locality not only provides new insights into the morphology and ethology if woolly mammoth, but also reveals evidence for cold seasonal climatic conditions during this period and its gradual change.

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PLIOCENE–PLEISTOCENE PRIMATES OF RUSSIA AND BOUNDARY COUNTRIES

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From Pliocene and Pleistocene of Russia (Transbaikalia), Mongolia, Ukraine, Moldova and Tajikistan representatives family of Cercopithecidae are know, including two subfamilies Cercopithecinae (2 genera, 4 (?) species) and Colobinae (2 genera, 3 species). From the territories of Russia and boundary countries 11 localities of this age with remains of Cercopithecidae monkeys are known altogether. Chronological distribution of Cercopithecidae from these localities is beginning the end of early Pliocene[1] (MN 14, 4.5 My) up to middle Pleistocene (0.35 My) (Table). In Moldova and Ukraine Cercopithecidae are make part to Moldavian (Ruscinian) and Chaprovian (Early Villafranchian) mammals assemblages. One genus of Cercopithecidae present in Late Pliocene of Tajikistan was part of equivalent of the Asiatic analogous of Late Chaprovian (Middle Villafranchian) mammal assemblages. Cercopithecida from Western Transbaikalia (Russia) were part of Early-Middle Villafranchian assemblages. The only a single representative of Cercopithecidae family is know from Middle Pleistocene of Georgia – genus *Macaca*. It was a part of Caucasian equivalent of Cromerian (Warm stage of Mindel or Interglacial IV). In the Late Ruscinian of South Moldova and Ukraine both subfamilies of Cercopithecidae co-exist: Colobinae (1 genus and 2 species: *Dolichopithecus ruscinensis*, *D. hypsulophus*) and Cercopithecinae (1 genus: *Macaca* perhaps including 2 species). Cercopithecinae and Colobinae are known together from at least two localities dated as Latest Ruscinian of Ukraine – Novopetrovka, Moldova – Budey (Table 1). Beginning the second half of Late Pliocene (from MN 16) only Cercopithecinae subfamily is present in the South of East Europe and in Tadjikistan. Stratigraphical distribution of the genus *Dolichopithecus* at the South of Ukraine is most probably limited to ages 2,2–2,4 Ma. From Late Ruscinian (?) – Early Villafranchian of Ukraine a species smaller than *D. ruscinensis* species, *D. hypsulophus*, is known. From *D. ruscinensis* it differs insignificantly in the structure of $C–P_4$ complex, in morphology of symphisal part of lower jaw and relatively smaller lower incisors. For the Late Pliocene–Early Pleistocene of Ukraine and Moldova genus *Paradolichipithecus* is not known. In the Late Pliocene of Middle Asia (Tajikistan) a representative of genus *Papio* is reliably determined. *Papio (Paradolichopithecus) sushkini* is a specialised representative of this genus. It is a medium animal in size and differs from other extinct and modern *Papio* in large bunodont molar teeth and in thick enamel. At Transbaikalia and Mongolia on the border of Early-Middle Pliocene only Colobinae subfamily (*Parapresbitys eohanuman*) are present and Cercopithecinae subfamily are absent. The latter appear in China and Korea in Middle Pleistocene and in Japan in Late Pleistocene. *P. eohanuman* is a representative of the group of Rhinopithecomorphes Colobine monkey, widely spread in Asia (Transbaikalia, Mongolia, Japan, China) in Late Pliocene–Early Pleistocene. It is the largest representative of Colobinae subfamily, characterised by robust upper and lower incisors. Enamel on labial surface of incisors has well developed shovelling. The lingual surface of incisors has an enamel pocket formed by lateral enamel folds. M3 has non-reduced distal pair of main cusps. The teeth system of *P. eohanuman* is relatively close to that in modern *Rhinopithecus roxellana*, *R. roxellana* is from Early Pleistocene of China. Middle Pleistocene representative of Cercopithecine subfamily from Georgia (*Macaca* cf. *sinica*), in the morphology of molars is closer to Asiatic *Macaca* the species group “sinica”, than European representatives of the genus *Macaca*.

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[1] In the paper Pliocene is subdivided into two parts.

Table. Chronological distribution of Cercopithecidae in Pliocene – Pleistocene of Russia and Boundary countries

Ages		Moa.	Country and localities	Mammal ages		Systematic groups of the Cercopithecidae	
						Cercopithecinae	Colobinae
PLEISTOCENE	Late Middle Early	0.35 1.85	Georgia (Kudaro 1)		Warm stage of Mindel (Interglacial IV of Cromerian)	*Macaca* cf. *sinica*	–
PLIOCENE	Late	2.2	Tajikistan (Kuruk-say)	Villafranchian	MN 16	*Papio suschkini*	–
		2.4	Mongolia (Shamar)		MN 16(?)	–	*Parapresbitys eohanuman*
			Russian western Transbaikalia (Udunga)		MN 16(?)	–	*Parapresbitys eohanuman*
		2.2–2.4 (?)	Ukraine (Kotlovina)		MN 16(?)	–	*Dolichopithecus* cf. *ruscinensis*
		2.5–3.4	Moldova (Gavanosa)		MN 15	*Macaca* sp.	–
			Moldova (Cebrikovo)		MN 15	*Macaca* sp.	–
	Early		Ukraine (Voynichevo)		MN 15	–	*Dolichopithecus hypsulophus*
		3.5 (?)	Moldova (Budey)	Ruscinian	MN 14/15	*Macaca* sp.	*Dolichopithecus ruscinensis*
			Ukraine (Grebeniki 2)		MN 14/15	*Macaca* sp.	–
		4.5	Ukraine (Novopetrovka)		MN 14	*Macaca* sp.	*Dolichopithecus ruscinensis*

MAMMOTHS FROM ZARAYSK: DATE ON AGE PROFILE AND THAPHONOMY

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The Upper Palaeolithic Zaraysk site (Moscow Region) (^{14}C dates – 23 000±400(GIN 8397a); 17 900±200 (GIN 8865)) is the most northern site of Kostenki-Avdeevo archaeological culture (gravettian tradition) on the Russian Plane. The complex stratigraphic context reflects that population of the same culture repeatedly occupied the site. It is allocated 4 chronological stages (levels) of inhabitation on the site starting from the first – the most ancient. With those levels it is possible to correlate the majority of the profound objects (pits, fire places etc.). Remains of mammoth (Mammuthus primigenius Blum., 1799) are most common and comprise 98% of total of mammal bones, which are present at the site. Some difference exists in the spatial distribution of the same skeletal elements of mammoth. The accumulation of bone assemblages were formed both as a result of man's hunting (the evidences of specialization hunting mammoth are absent for the present) and as a result of transporting remains from natural bone-bearing locality, which according to geomorphological data could be probably located near the site. The great number of mammoth bones and especially representation of skeletal elements is the evidence of their economic importance. During the season of 2001 remains of mammoth were collected on the excavated square 19 m^2. Remains are: skulls – 5 (11,4% of total number of bones), lower jaws – 6 (13,6%), scapulas – 2 (4,5%), long bones – 3 (6,8%), isolated teeth – 13 (29,5%), tusks – 4 (9,2%), distal elements – 1 (2,2%), ribs – 4 (9,2%), other bones – 6 (13,6%). Counting by the teeth remains, the minimal number of individuals was 11. Other species are presented only by 13 bones of polar fox (Alopex lagopus), 1 bone of Marmota sp. Mammoth remains are mainly complete but their level of preservation is rather bad, with a heavy degree of weathering that makes them very fragile and cracked. Skulls and some bones were crushed. Mainly big bones could be correlated with the third chronological level. The analysis of mammoth remains composition shows that only adult individuals were found at the site. The following age groups are indicated: 6–8 years – 1; 12–20 years – 3; older 30–35 years – 7. Bones of juvenile and subadult animals are absent. Thus, relatively small size individuals older than 30–35 years are predominant in the collection. Mammoth cows and bulls are probably presented in equal quantity. According to two humeral lengths with fusion epiphyses (approximately 104 and 77 cm), large mammoth bull had a skeletal height of 3.09 m and one mammoth cow was smaller (2.43 m). These characteristics correspond to size variation of mammoth population during Late Pleistocene. Large diameters of tusks such as 18–21 cm are the maximum values for species M. primigenius on the Central Russia during that time. Morphological analysis of teeth dp4–M3 (Table 1) shows their homogeneous selection for all stratigraphical layers (chronological stages) that allow suggesting existence of homogeneous mammoth population during all this period. The main morphological characteristics of teeth correspond to those of the samples of species M. primigenius from Late Pleistocene in Central Russia. Thickness of enamel for M3/m3 is 1.6–1.8/1.2–2.1 and frequency of plates on 10 cm is 11(?)–12. Morphological comparison of mammoth teeth from Zaraysk and Kostenki I, (layer 1) (Table 2) shows no principle differences. The reason for that could be in existence of a common area of mammoth population in Central Russia during 17 000–23 000 BP. Analysis and comparison of faunal data from the whole area of the site is the key element in solving the question concerned with hunting activities of ancient inhabitants and reconstruction of their economy characteristics.

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Table 1. Measurements (mm) of mammoth's teeth from Zaraysk site

Teeth generation/ field number	Length/ width of the tooth	Total number of plates	Lamella frequency	Enamel thickness	Length/ width of the plate	Interplate width (max)
M2–M3 (?)/ E–8 (Pit A, depth 138/–150)	–/83	–	12	0, 85	6,5/73	3,8
M2–M3 (?) / E–7 (depth 164/–171)	–/74(?)	–	–	1,2	–	–
M^2–M^3 (?) / ZH–10 (depth. 139)	–/72,5	–	–	1,1	7,5/67,5	4
M_2–M_3 (?) / E–7 (Pit A, depth 167/–172)	–/71(?)	–	–	1,5	–	–
M^3 / G–10 (Pit A, depth 153/–157)	–/75(?)	–	–	1,2	–	5,5
dP^4 / B–9 (Pit B, depth 124/–133	136,5/58	16	12	1,2	6,5/51	3,5
M ? / B–9 (Pit B, depth –129, fossils soil)	–	–	–	1,3	–	–
M^2 (dex) / E, ZH–8, (Pit A, depth 148/–190)	–/82	10	11(?)	1,4	6/–	4,5
M_3 (sin) / G–10 (Pit A, depth 174/–183)	23(?)/61,5	20 plates remains	12	1,2	7,9(?)/ 89(?)	5
M^2 (?)/E–8 (Pit A, depth 141/–165)	–/72(?)	–	–	1,4	6,5/70	4,5
M_1 / ZH–11 (depth 133/–156)	–/63(?)	–	–	1,4	7,5/–	5
M_2 (?)/ E, ZH–11 (depth 128/–148)	–/85	–	11	1,8	–	–
M_1 / ZH–10, 11 (depth 129)	–	–	–	1,4	–	–
M_2 / ZH–11 (depth 151/–169	200/78	19	12	1,6	9/62	2,5

Table 2. Mammoth's teeth morphology in Zaraisk (2000–2001) and Kostenki I Sites, Layer 1 (Urbanas, 1980. Treatises of Zoological Institute Academy Sciences of the USSR. 93)

Length of the tooth		Width of the tooth		Total number of plates		Enamel thickness	
Zaraisk	Kostenki	Zaraisk	Kostenki	Zaraisk	Kostenki	Zaraisk	Kostenki
dp4 / dp_4							
136 / –	104–110 / 94–128	58 / –	48–56 / 45–58	16 / –	11–13 / 11–12	1.2 / –	0.95 / 0.95
M1 / M_1							
123 / –	–	56–59(?) / –	–	16 / 19	–	1.0–1.4 / 1.4	–
M2 / M_2							
– / 200	152.5–200 / 142–205	72–83 / 78–85	70–79 / 64–92	– / 19(?)–20	14–18 / 15–18	0.9–1.4 / 1.2–1.4	1.1–1.5 / 1.2–1.8
M3 / M_3							
– / 230	250–269 / 220–309	101–110 / 61.5	76.5–91 / 80–91	– / –	23–25 / 20–26	1.6–1.8 / 1.2–2.1	1.5 – 2 / 1.7–2.1

AGE PROFILE AND MORPHOLOGY OF *MAMMUTHUS PRIMIGENIUS* IN THE VOLCH'YA GRIVA LOCALITY

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Volch'ya Griva (VG) (Mamontovoe village, Kargat District, Novosibirsk Province) represents the most important and unique late Pleistocene locality of mammoth remains (*Mammuthus primigenius*). In this locality, five thousand of mammoth bones comprising more than 98% of the total number of mammal remains, and most probably belonging to 50 individuals have been found since the end of sixtieths. Age of the VG locality estimated by 14C is 17800±100 years. Most part of sediments is of aqua origin. Bone bearing layers are represented by loessal alevrolites and comprise three stratigraphical levels: lower (2), middle (1), upper (0). At the level 0, bones are strongly weathered, compared to the levels 1 and 2, and represented mainly by large bones (scapula, pelvis, low jaw, scull fragments, tusks, long bones). Surface distribution of bones demonstrates, that bones belonging to one and the same skeleton are found in rather compact accumulations. In anatomical position can be seldom found bones of leg distal parts and vertebras. The same kinds of bones are the most abundant in the locality. This, together with other data on taphonomy, suggests low transport of remains.

Among two thousand four hundred seventy three bones of *M. primigenius* found in 1991 and belonging at least to eighteen animals, all parts of skeleton can be found. They do not demonstrate any sorting according to size in weight, thus indicating both rather favourable burial conditions and lack of transportation. Five calves from newborn baby to individuals of 4–6 years, three individuals of 6–17 years, and eleven individuals older than 17 years are represented. Non-pubertate individuals comprise about 44%, similarly to recent African elephants (*Loxodonta africana*). Almost the same age profile can be discerned in the other late Pleistocene locality, Shestakovo (Kemerovo Province), where remains of non-pubertate animals approximate 40%. Size variability of bones is as follows: femur (diaphyses) – 95 cm, with fused epiphyses: 107–119 cm; humerus (without caputs): 67–102 cm, with fused epiphyses: 84.5–97 cm; ulna – 45–60 cm (diaphyses); radius – 45 cm; tibia – diaphysal length: 30–59 cm, fused epiphyses 67.8 cm; fibula – diaphysal length: 28 cm, with fused epiphyses: 44.6 cm. The height of the largest individual in shoulder reached 326–328 cm (380 cm) (measured by tibia) or 312–314 cm (370 cm) (measured by humerus). The height of the smallest individual is 208–210 cm (230–248 cm) (measured by fibula). Therefore, some mammoth bulls were bigger than the Adams' mammoth. Sizes of permanent tusks indicate, that only tusks of adult individuals have been preserved. Tusk diameters at the level 2 vary between 200 and 112 mm, at the level 0 – between 91 and 53 mm. Based on the data of tusk diameters commonly encountered in the late Pleistocene of Siberia, one can conclude, that in the VG locality only tusks of bulls (141–200 mm in diameter) and cows (53–115 mm) are present, whereas deciduous tusks are lacking.

In this locality, morphology of M1–M3 differ in specimens from various levels (Tabl. 1, 2). Two groups differing in enamel thickness, lamellae frequency, length of the plate, degree of enamel folding, and in size of the crown can be discerned. Some M3 differ in size almost by 50%, thus suggesting that they belong to individuals from different populations. Possibly, M3 with thick enamel and low number of plates are confined to the lower level, and M3 with thin enamel and high plates frequency – to the middle and upper levels. Presence of the two M3 morphotypes does not disagree with 14C data. Increase in M3 enamel thickening and decrease of plates number similar to those characteristic of the M3 from the level 2, was reported for the late representatives of *M. primigenius* from the Sevsk locality (Bryansk Province, Russia). In *M. primigenius* from the late Pleistocene – Holocene of the Vrangel Island (North-East Asia, Russia), on the contrary, the number of plates in M3 probably reaches the maximum reported for the species, although the enamel thickening is very low. This could indicate, that at the end of the late Pleistocene a kind of polymorphism existed in mammoth populations.

Presence of special sources of mineral nutrition, the beast solonetzs, visited by mammoths regularly during centuries, account for existence of the VG and Shestakovo localities. The name beast solonetz is adopted in Russia for a ground surface site containing great amount of certain macro- and microelements. It denotes a zoogeological unit, in distinction to solonetz as a pedological nomination. Animals came there to eat soil and rock and to drink mineralized water from springs, in order to maintain the water-salt balance and make up a deficiency of minerals in their organism. In West Siberia, the beast solonetzs were distinguished by high content in rocks of Ca, Mg, Na, Co, Cu, Zn and other elements necessary for the normal regulation of mammoth metabolism. As one can judge based on the analysis of the mammoths remains, the VG beast solonetz was regularly visited by both family groups (cows and calves) and mammoth bulls.

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Table 1. P4–M3 measurements (in mm) from the levels 1 and 0 in the Volch'ya Griva locality

Length of the tooth	Width of the tooth	Number of plates	Enamel thickness	Lamellae frequency	Interpolate width (max)	Length of the plate
P^4/P_4						
– / 84(?)–112	– / 46–53.5	– / 11–12	– / 0.9–1.3	– / 11	– / 3–3.3	– / 5–8
M^1/M_1						
–	– / 58.5	–	– / 1.1	– / < 10	– / 6.5	– / 5(?)
M^2/M_2						
– / 246	58–60 / 63–82	– / 16(?)–21(?)	0.8 (?)–1.4 / 1.8–2	13 / 7.5–8.5	2.2–4 / 6–6.5	5.5 / 6.2–7.8
M^3/M_3						
231 / (220?) 281–329	82–107 / 86–111	23 / 22(?)–29	1.8–1.9 / 1.5–2	8–10 / 8.5–13(?)	5–6 / 4.5–6.5	8–8.5 / 6–7

Table 2. P4–M3 measurements (in mm) from the level 2 in the Volch'ya Griva locality

Length of the tooth	Width of the tooth	Number of plates	Enamel thickness	Lamellae frequency	Interpolate width (max)	Length of the plate
M^2/M_2						
–	– / 75–82	–	0.8 (?) / 2	– / 6(?)–8.5	– / 6.5	– / 6.2–7.8
M^3/M_3						
– / 329	60 / 83–111	– / 29	– / 1.8–2	– / 7–8.5	– / 5–6.5	– / 8

CORRELATION BETWEEN LATE CENOZOIC ALLUVIAL UNITS OF THE CENTRAL AND SOUTHERN PARTS OF THE EAST EUROPEAN PLAIN AND THE MAIN PALEVENTS

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New correlation between Late Cenozoic alluvial units of the greatest East European Plain rivers on the base of the well-known and latest data is represented. It is a result of sweeping generalization carried out in the scope of IGCP Project "Global correlation of Late Cenozoic fluvial deposits". The stratigraphic position of the identified suites and series is established with reference to index beds and to palaeontological (mammal and molluscs), palaeo magnitostratigraphic, geomorphologic, geochronological and archaeological evidence.

General Time Scale				Ukraine - Russia subdivisions Age of lower boundary, Ka	Faunistic complex	Alluvial series and suites: Middle Dniester	Middle Dnieper Basin	Upper Don	Middle Volga	Palaeomagnetic epoch
QUATERNARY Q	HOLOCENE Q_4				Upper Palaeolithic	Flood plain St. Parkany St. Slobodzeja St.	Modern St. Trypillia St.. 2-nd terrace Sr. (2)	Flood plain St. 1-st terrace Sr. (2) 2-nd terrace Sr. (2)	Flood plain St.	BRUNHES
	PLEISTOCENE	Upper Q_3	Neopleistocene	Upper 140					1-st terrace Sr. (2) 2-nd terrace Sr. (2)	
		Middle Q_2		Middle 440	Khazary	Speja St.	Hnidyn St. (2)	3-d terrace Sr. (2) 4-d terrace Sr. (3)	Periglacial Sr. (3)	
					Syngyl'	Varnitsa St.	Dnieper Glaciation Kryvichi Sr. (2)	Liski St. Strelitsa St.	Zhiguli Sr. (4) Kryvichi Sr. (3)	
				Lower 820	Tiraspol'	Kolkotov St. Koshnitsa St. Michailovka St.	Traktemyriv Sr. (?)	Tafino St. Muchkap St. Don Glaciation Yuzhnovoronezh Sr. (3) Petropavlovka St.	Venedy Sr. (3) Solikamsk St.	
		Lower Q_1	Eopleistocene	Upper 1350 Lower 1800	Taman'	Kosnitsa Sr. (2) Boshernitsa St.	Break	Goryanka Sr. (3)	Azino St. Gorki St. Laishevo St.	MATUYAMA
NEOGENE	PLIOCENE	Upper N_2^2		Akchagylian 3000-3400	Khapry	Rashkov Sr. (2) Vaduluivody St. Runkashov St.	Chornobyl Sr. (3)	Belaya Gora St. Uryv Sr. (2)	Akchagylian transgression	GAUSS
		Lower N_2^1		Cimmerian 5000-5300	Moldova	Kuchurgan St. Stol'nicheny Sr.	Parafiivka Sr. (?)	Usman' Sr. (2)	Kinel' Sr.* (3) Break	GILBERT
	MIOCENE	Upper N_1^3		Pontian Meotian Sarmatian 13600		Balta Sr.	Pyryatin St. Shostka Sr. (2)	Fomenkovo St. Novobogoroditsa St. (Starinka St.?)	Alluvial St. ?	
		Middle N_1^2		Konka Karagan Chalkrack 16500		Predominant marine environment	Environment unclear	Predominant marine environment Uvarovo St.	Break	

Materials according Upper and Middle Don are combined after: Krasnenkov & Holmovoy, 1985 (Neogene); Iossifova, 1977 (Neogene); Iossifova, 2001 (Middle Pleistocene); Grischenko, 1985 (Upper Pleistocene – Holocene). Materials according Middle Volga are combined after: Bludorova & Fomicheva, 1985 (Neogene); Goretskiy, 1966 (Quaternary). St. – suite, Sr. – series, in brackets – the number of the suites in series. * The age of Kinel' Series lower boundary is not established.

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PLEISTOCENE PEDOGENESIS IN UKRAINE

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Conditions of **the Pleistocene** deposits formation in Ukraine were contrast. It is caused, first of all, with the developing of cover glaciations, in the Dnieper period in particular. Alternation of the warm (interglacials and interstadials) and cold (glacials, large stadials) stages in the subaerial facies of palaeosols, soil suites (pedocomplexes) and loess horizons were especially rhythmic, that is depicted in the scheme of palaeogeographical stages of the Pliocene and Pleistocene of Ukraine (Veklych et al., 1993). At the same time, each palaeogeographical stage and stratigraphical horizon has its own characteristics of structure, composition, spread, thickness, forms of relief, soil suites and covers, palaeolandscapes and climate. These characteristics were different in the early, middle and late Pleistocene.

Still beginning from **the Eopleistocene** (the Kryzhanivka stage), brown soils of the temperately warm and warm conditions dominated. The brown soils formation went together with loess and clay formation. And only in the Pleistocene there were fixed processes of podsolization, most characteristic of the Lubny, Kajdaky and Pryluky stages (for the lower soils of the optima). First they are observed in soils of the Lubny period. In **the Early Pleistocene** warm stages (*sh, mr, lb*) in the Kiev Dnieper area, in the early optima there were formed brownish-cinnamonic and cinnamonic-brown forest soils (in *sh* and *mr* periods), loessic and podsolized soils (*lb*), while in the more late climatic optima the Early Pleistocene soils were similar to meadow soils of temperately warm climate – cinnamonic, chernozem-like dark colored thick.

Soils similar to the recent ones were formed in **the Middle Pleistocene**. Soils became more podsolized during the early optimum of the Kajdaky and Pryluky stages that proves Subboreal climatic conditions. Turf-podsolized, light grey and grey forest soils characterized by clear differentiation by eluvia – iluvial type were widely spread in the territory of Ukraine. It is proved by the presence of eluvia or humus-humus horizon, accumulations of iron and aluminum oxides in the iluvial horizon.

Soils that resemble chernozems were formed in the late climatic optima of the Middle Pleistocene in the area of the recent forest-steppe and southern steppe. The typical chernozems began developing only in the post-Dnieper times (the second part of the *kd* and *pl* stages) but they belong to the chernozems of the meadow type.

The soil forming processes in **the Late Pleistocene** did not also led to formation of the real chernozems in the area of the recent forest-steppe and steppe of Ukraine. In the first half of the climatic optima of the Vitachev and Dofinifka stages in the Kiev Dnieper area there were formed thin brown and clayey soils, while thin chernozem-like soils were formed in it second half. The soil forming processes were not mature in the *vt* and *df* stages because of the lack of time for the formation of the complete profile of soil. Lower soils reflect more humid soil forming conditions.

Loesses and loess loams, aqua terrace deposits, etc. were formed in the Pleistocene cold staged. Deposits of the Dnieper moraine are observed along the Dnieper valley up to the Dniepropetrovsk city. The loess forming conditions were mainly cold and periglacial, but formation of interlayers of initial soils (up to 3–4 in the bg stage) are referred to a slight warming.

So, soils of moderate or moderately warm climate were mainly formed during the Pleistocene warm stages. And only in the south of Ukraine in a zone of the recent southern steppe, subtropical or similar to them conditions were formed, mainly in the Dnieper time. Towards the Holocene, climate of warm stages was becoming more continental, contrast and arid. Real chernozems were formed only in the post-Dnieper times. In the cold stages, the environments changed from glacial and humid to periglacial (in the larger part) cold, temperately cold and more arid than now.

CLIMATE CHANGE DYNAMICS IN NORTHERN EURASIA OVER THE LAST INTERGLACIAL: EVIDENCE FROM MOLLUSC-BASED ESR-CHRONOSTRATIGRAPHY AND VEGETATION SUCCESSIONS OF THE LOESS-PALAEOSOL RECORDS

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Response of different components of palaeoenvironmental system to the repeated climatic changes is a global phenomenon. All components are in close interrelation with each other, and through certain parameters of one of them the qualitative evaluation of the others or of the natural environment on the whole can be given. In the present study information on the dynamics of the climate changes through the last interglacial time is derived from the two independent sources of palaeoenvironmental data: electron spin resonance (ESR) chronology of warm-climate-related deposits and palynological record of vegetation response to climatic variability and palaeoenvironmental events.

Subfossil mollusk shells are often found in uplifted marine deposits. Dating of these fossils can provide an independent chronology of global ice volume and sea-level/climate change.

Over 130 mollusk shell samples from more than fifty-five sites along the continental margin of Eurasian north, in the Black and Caspian Sea basins dated via the ESR method revealed absolute ages within the time span from 145 to 70 ka. The dating frequency distribution for the whole collection of shells taken in Northern Eurasia displays peaks and troughs that can be correlated with climatic variations during isotope stage 5. Low frequency intervals (ca. 130, 115, 100 and 75 ka ago) apparently correlate with the global cooling events during which the submerged area was substantially reduced.

To solve debatable questions regarding the climatostratigraphy and correlation, the palynological data from complete sections, which allow reconstructing a continuous record of climatic events during the whole Late Pleistocene, are of great importance. Such pollen diagrams have been obtained from a number of loess areas of the southern half of the East-European Plain (the Central Russian Upland, the Dnieper Lowland, the Near Dniester region, the Oka-Don Plain, in the East Caucasian Piedmonts and others). The reconstructed successions of vegetation testify that the complex dynamics of climatic changes did not occur during the last (Weichselian) glacial period only, but also during the last (Mikulino) interglacial. The Mikulino climatic rhythm is divided into two parts: the thermoxerotic substage with the warm and relatively dry climate in the first half of the interglacial and the succeeding thermohygrotic substage with the warm, but more humid climate. This regularity in the dynamics of the late interglacial has been established by M.P. Grichuk and V.P. Grichuk (1960). Our palynological studies have revealed two endothermal coolings within the Mikulino interglacial. The main one occurred between above-named substages and has been recorded in all investigated regions. Another cooling has been established in the Arapovichi section only in the first half of interglacial. Occurrence of some palynologically unrecognized yet intra-interglacial coolings cannot be also excluded.

The above data demonstrate that (i) the last interglacial event in Northern Eurasia may have been long lasting, correlating most likely with the whole of isotope stage 5 rather than substage 5e only; (ii) during the “cold” periods of isotope stage 5 coastal areas of Eurasian north were partly occupied by transgressive basins; (iii) time-dependent frequency distribution of all the ESR-dates obtained for the last interglacial displays at least four time intervals that can likely be correlated with the coolings and phases of sea regression; (iv) according to palynological investigation the intra-Mikulinian cold phase seem to be less dramatic in Northern Eurasia than suggested by the variability in the deep-sea isotopic records; (v) the reconstructed successions of vegetation testify that the complex dynamics of climatic changes occur during the last (Mikulino) interglacial.

THE TAMANIAN MAMMAL ASSEMBLAGE (EARLY PLEISTOCENE) OF THE EASTERN EUROPE (TAMANIAN PENINSULA, BLACK SEA AREA, RUSSIA)

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The remains of mammals from six localities on the Tamanian peninsula (Black Sea area, Russia) were investigated in order to characterize the Early Pleistocene stage in the evolution of the mammalian fauna of eastern Europe. *Archidiscodon meridionales tamanensis* and *Elasmotherium caucasicum* are the most typical species of large herbivores in this assemblage. Small species are represented by *Mimomys intermedius*, *Prolagurus pannonicus* and *Allophajomys pliocaenicus*.

Fossil remains of mammals of the Tamaniam assemblage are known from six localities of the Tamanian peninsular: Sinaya Balka, Tsymbal, Kuchuguri, Akhtanisovskaya, Fontalovskaya, Kapustina Balka. These localities differ from each other in terms of the diversity of species, type of preservation, quantity of bones, and also taphonomy.

The type locality of the Tamanian assemblage – Sinaya Balka – is represented by clastic rocks with numerous mammalian remains. It is the richest site, having yielded 991 specimens belonging to 9 species. Unfortunately, this material is usually difficult to identify due to its poor state of preservation. However, it is clear that this site is dominated by *Archidiskodon meridionales tamanensis*, *Elasmotherium caucasicum* and *Equus* cf. *sussenbornensis*. The most common remains are parts of tusks and separated teeth, fragments of bones being relatively rare.

The Tsymbal locality is characterized by the largest number of species despite the smaller overall quantity of remains recovered from the site (i.e., 22 species among 272 specimens). The other four sites yielded even sparser fossil remains (1–9 specimens) which nonetheless belong to the same Tamanian assemblage.

The Tamanian assemblage is correlated with the Razdoljinsky mammalian assemblage (Western Siberia). It corresponds to zone MNQ 20 of Mein-Guerin scheme of the continental deposits of western Europe, and is believed to have thrived between 1.1 and 0.8 Ma ago.

PALAEOENVIRONMENT OF THE LATE PLIOCENE IN THE TERRITORY OF UKRAINE (BY THE DATA OF MINERAL COMPOSITION OF DEPOSITS)

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The lower boundary of the Late Pliocene in the territory of Ukraine passes (Veklych et al., 1993) through the foot of the cold Siver stage's deposits (2800 Kyr), while of the Eopleistocene – in the foot of the Berezan stage (1900 Kyr). Palaeoenvironments of these periods are notable for alternation of cold (Siver) and warm (Beregov) stages of nature development.

Clays, loess loams and loesses were formed in cold stages. Suites of palaeosols of different types represent deposits of warm stages. They are characterized by a con siderable thickness, by brown, red, cinnamonic color, by high content of clay (up to 40–57% fr. $< 0{,}001$), by high dispersity of mineral mass and by enrichment in sesquioxides.

Formation and changes of mineral material of the loess-soil deposits were mainly predetermined by the landscape – climatic conditions of palaeoenvironments. Duration of these stages largely influenced the mineral material composition, while the lithogenic base and conditions determined the character of formations and of the secondary changes of the mineral mass. Environmental changes are fixed by the clay component as the most active part of the mineral phase of deposits.

Argillaceous material of the Late Pliocene deposits is represented by polymineral composition.

Deposits of the Siver (sv) stage (2800–2430 Kyr) have been represented by clays of ash-grayish – light grey and yellow – brown colors, often loessial. Their thickness is 0.5–7.0 m. The presence of soil embryonic interlayers of up to 0.5–1.2 m thick is a peculiar feature of these deposits. In the Siversky Donetz river basin there are 4–5 meadow -marshy soils in a sequence. In the plain areas they are represented by cinnamonic-brown and brownish-cinnamonic soils usually divided by thin interbeds (up to 0.2–0.3m) of loess clays.

Minerals of the smectite group and hydromicas dominate the clay material composition of the Siver deposits. Clay interbeds in the Kiev Pridnieprovje, Pridonetz plain and Lower Pridniestrovje are notable for a higher content of hydromicas. Soil horizons of the Donbass area are characterized by the presence of goethite and sometimes of calcite and gypsum.

Such characteristics of the stratum's structure, of the mineral composition, regional peculiarities, duration of the stage (370 Kyr) point to the repeated alternations of cold dry periods with more humid and rather warm stages (a period of soil interbeds formation) during the Siver stage.

During the subsequent Beregov (bv) stage (2430–1900 Kyr) in the larger part of Ukraine, environmental conditions largely changed towards warmth that favored the development of intensive processes of soil formation resulted in formation of thick (up to 3–5m) soil suites of the optimum (bv b) and final (bv c) stages of development. Soil covers of the Middle Pridnieprovje and Donbass areas were dominated by cinnamonic, dark cinnamonic transitional to brown soils types, further to the south (Lower Pridniestrovje, Prichernomorje) – by reddish and red – cinnamonic soils.

The smectite group minerals and mixed layer formations dominant mineral content of the clay material of the Beregov soils. In contrast to the Siver stage deposits, the hydromica content (an indicator of cold environment) is sharply diminishing in these soils. Presence of goethite and a large quantity of kaolin in soils of the Kiev Pridnieprovje, Donbass and Lower Pridniestrovje areas proves warm humid conditions of their formation, weathering and transformation of the mineral mass. It is especially peculiar to the soils of the optimum stage of development. The climatic conditions of the Beregov stage were obviously similar to subtropical. In the southern areas of Ukraine, the thin dispersed part of the Beregov soils is characterized by the presence of calcite and gypsum that reflects alternation of arid and humid periods (bv b1) in the nature development.

LARGE CARNIVORE AND HERBIVORE GUILDS FROM MIDDLE PLIOCENE TO LATE PLEISTOCENE IN ITALY

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From the Middle Pliocene to the Late Pleistocene, the Italian large mammal faunas changed in richness and diversity as well as in percentage of forms that lived in different environments. An attempt is made to investigate if there is a link between variations in the structure of herbivore and carnivore ecological groups and the main climatic changes, according to the following biochronological scheme.

MAMMAL AGES	VILLAFRANCHIAN								GALERIAN					AURELIAN					
	EARLY	MIDDLE			LATE				EARLY	MIDDLE			LATE	EARLY	MIDDLE	LATE			
FAUNAL UNITS	Triversa	Montopoli	*S.Vallier*	Costa S. Giacomo	Olivola	Tasso	Farneta	Pirro	Colle Curti	Slivia	Ponte Galeria	Isernia	Fontana Ranuccio	Torre in Pietra	Vitinia				
OXYGEN ISOTOPIC STAGES														OIS 10-8	OIS 7-6	OIS 5	OIS 4	OIS 3	OIS 2
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LARGE CARNIVORES																			
Gulo gulo																	—	—	—
Ursus minumus	—																		
Ursus etruscus					—	—	—	?											
Ursus sp. (? *Ursus rodei*)								?	—										
Ursus deningeri										—	—	—	?						
Ursus spelaeus														-·-	-·-	-·-	-·-	-·-	-·-
Ursus arctos													- -	- -	—	—	—	—	—
Canis ex gr. *C.etruscus*				—	—	—	—												
Canis arnensis					—	—	—												
Canis aff. *C. arnensis* (advanced form)								—	—										
Canis sp. aff. *C. arnensis/Canis* aff. *C. mosbachensis*										—	—	—	—	—	—	—	—	—	?
Canis (Xenocyon) falconeri						—	—	—	—	?									
Cuon alpinus													—	- -	- -	- -	—	—	—
Canis lupus														—	—	—	—	—	—
Chasmaportetes lunensis	—	—	—	—	—														
Pliocrocuta perrieri	- -	—	—	- -															
Pachycrocuta brevirostris					—	—	—	—	—	—									
Hyaena prisca											?	—							
Crocuta crocuta											—	—	—	—	—	—			
Megantereon cultridens/ M. cultridens (advanced form)-*M. Whitei*	?	—	—	—	—	—	—	—											
Homotherium ex gr. *H. crenatidens*	—	—	—	—	—	—	—	—	—										
Homotherium ex gr *H. latidens*										- -	—	—	—						
Lynx issiodorensis	- -	—	—	—	—	—	—	—											
Lynx sp.										?	?	—	—	—					
Lynx lynx														—	—	—	—	—	—
Acinonyx pardinensis	—	—	—	—	—	—	—	—											
Panthera ex gr. *P. gombaszoegensis*					—	—	—	—	—	—									
Panthera pardus												—	—	—	—	—	—	—	
Panthera leo fossilis												—	—						
Panthera leo spelaea														—	—	—	—	—	—
HERBIVORES																			
PROBOSCIDEA																			
Zygolophodon borsoni	—																		
Anancus arvernensis	—	—	—	—															
Mammuthus (Archidiskodon) meridionalis		—	—	—	—	—	—	—	—	—	?								
Mammuthus (Mammuthus) trogontherii										—	—	—	- -						

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Mammuthus ex gr. *M. chosaricus-M. primigenius*															—	—	—	—	— -
Elephas (Palaeoloxodon) antiquus										—	—	—	—	—	—	—	—		
PERISSODACTYLA																			
Tapirus arvernensis	—																		
Equus livenzovensis		—																	
Equus stenonis			—	—	—	—	- ?												
Equus stehlini						—	—												
Equus altidens							—	—	—	—	—	—	—						
Equus ex gr. *E. bressanus-E.suessenbornensis*							—	—	—	—	—	—	—	— ?					
Equus hydruntinus															—	—	—	—	—
Equus ferus												? —	—	—	—	—	—	—	—
Stephanorhinus jeanvireti	—	—																	
Stephanorhinus etruscus		—	—	—	—	—													
Stephanorhinus aff. *S. hundsheimensis*							—	—	—										
Stephanorhinus hundsheimensis									—	—	—	—	—	—	- -				
Stephanorhinus hemitoechus										—	—	—	—	—	—	—	—	— ?	
Stephanorhinus kichbergensis										—	—	—	—	—	—	—	— -		
Coelodonta antiquitatis																	—	— -	?
ARTIODACTYLA																			
Hippopotamus ex gr. *H. antiquus*						—	—	—	—	—	—	—	?						
Hippopotamus ex gr. *H. amphibius*													—	—	—	—			
Procapreolus cusanus	—																		
Capreolus sp. aff *C. suessenbornensis*									- -	—	—								
Capreolus capreolus												—	—	—	—	—	—	—	—
Croizetoceros ramosus		—																	
Axys lyra (=Pseudodama lyra)	—	—	—	—															
Axys nestii (=Pseudodama nestii)					—	—													
Axys eurygonos (=Peudomama farnetensis + P. sp.)							—	—	—	—	—	- ?							
Dama clactoniana										?	?	—	—	—	—				
Dama dama															—	—	—	—	?
Cervus elaphus										—	—	—	—	—	—	—	—	—	—
Eucladoceros falconeri		—																	
Eucladoceros tegulensis			?	—															
Eucladoceros dicranios/Eucladoceros ctenoides					—	—													
Megaceroides obscurus							—	- -											
Megacerini gen spec indet									—	—	—	—	—						
Megaceroides verticornis									—	—	—	- -							
Megaceroides solhilacus												—	—						
Megaloceros savini										?	—	- -							
Megaloceros giganteus														—	—	—	—	—	—
Libralces gallicus					···	···	—	···	···										
Alces alces																	?	?	—
Gazella borbonica		—	—	—															
Gazellospira torticornis				—															
Leptobos etruscus					—	—	- -												
Leptobos stenometopon	—	—																	
Leptobos ex gr. *L. merlai - L. furtivus*		-	- -	—	—	- -													
Leptobos ex gr. *L. vallisarni*						—	—												
Bubalus sp.														—	?				
Bos galerianus											—								
Bos primigenius												—	—	—	—	—	—	—	—
Bison (Eobison) degiulii								—	—										
Bison sp. aff. *B. schoetensacki*									—										
Bison schoetensacki										- -	—	—	—						
Bison priscus													?	?	—	—	—	—	— -
Ovibovini gen. et spec. indet.								—											
Ovis amnon												—							
Praeovibos sp.						—													
Gallogoral meneghinii			?	—	—														
Procamptoceras brivatense					—														
Hemitragus bonali												—							
Capra ibex															—	—	—	—	—
Rupicapra sp.															—	—	—	—	—

THE DYNAMIC MODEL OF THE LATE PLEISTOCENE ECOSYSTEMS COVER OF DNIEPER AREA

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Proposed model is based on studying of small mammals fauna from recent riverbed Dnieper alluvium. Alluvium of the recent riverbed terrace contains fauna, which was redeposit from the I and II terraces during recent flood plain forming. According to the existing technique [Gromov, 1957], the groups of fossility ("f", groups of remains, characterized by similar degree of fossilization, and, accordingly, by similar geological age) were picked out. Their geological age was defined on the base of the evolutionary level comparison of the Dnieper alluvium fauna and of micromammals localities "*in situ*": IIIf – Mikulino time and Early Waldai, IIf – Middle and Late Waldai, If – Holocene.

Peculiarities of faunistical composition dynamics demonstrated, that the Dnieper valley had been playing a role of natural refugee for forest and meadow species of micromammals (*Microtus agrestis*, *M.* cf. *arvalis*, *Clethrionomys glareolus*, *Sylvaemus* sp., *Cricetus cricetus*) during Waldai glaciation, when arid frosty climate and permafrost spreading prevented their expansion on watersheds. Moreover, tundra-alike patches are to occur on the bottom of valleys. Their presence is confirmed by palaeomalacological analysis data (Kunitsa, 2001). On such patches on the Middle Dnieper was living *Dicrostonyx gulielmi*, and on the Low Dnieper – *Microtus gregalis*. These species were dominant further to the North, but on the South periphery of their areals they were confined to riverside biotopes. Abundance of steppe and semi-desert rodents during the chronological intervals, for which, according to the palynological reconstructions data, forest vegetation existed (for example, Mikulino time), also attracts attention. Foregoing facts indicate an unusual stability of qualitative composition of the Late Pleistocene micromammals fauna to the influence of climatic changes.

Factor of diversity plays an important role in forming of ecosystem stability, and includes heterogeneous spatial distribution (patchiness) of the Pleistocene biota. Periodical spreading of permafrost promoted patched landscape forming, so as grazing of megaherbivores, which played a significant surrounding-making role during the Late Pleistocene (Puchkov, 1988). For this reason, an arboreal vegetation of the Late Pleistocene had no continuous character, and varied from park forests to savannah-alike landscape. So, forest-steppe of the Late Pleistocene and the recent one should differ principally by their integral parameters, even if they have completely identical qualitative and quantitative composition.

Climatic changes initiated spatial regrouping along the geomorphological profile of local associations, which had a qualitative originality (Fig.). Periodical passing of forest flora through the slope stage, obviously, caused its submountainous character; balneology investigations refer to (Borisova, Gurtovaja, 1994). Steppe and semi-desert associations also passed this stage periodically. During the interglacials they might have been preserved on dry, sunny slopes.

Vertical displacement of ecological associations, partly corresponded to recent variants of climatic zones, took place during the second part of the Pleistocene. At the end of the Late Pleistocene – on the beginning of the Holocene this mechanism got broken. It caused extinction of specific for periglacial fauna forms of mammals, reduction of areals of many species and spreading of enough monotonous micromammals associations, consisting mostly of *Muridae* and voles of arvalis branch.

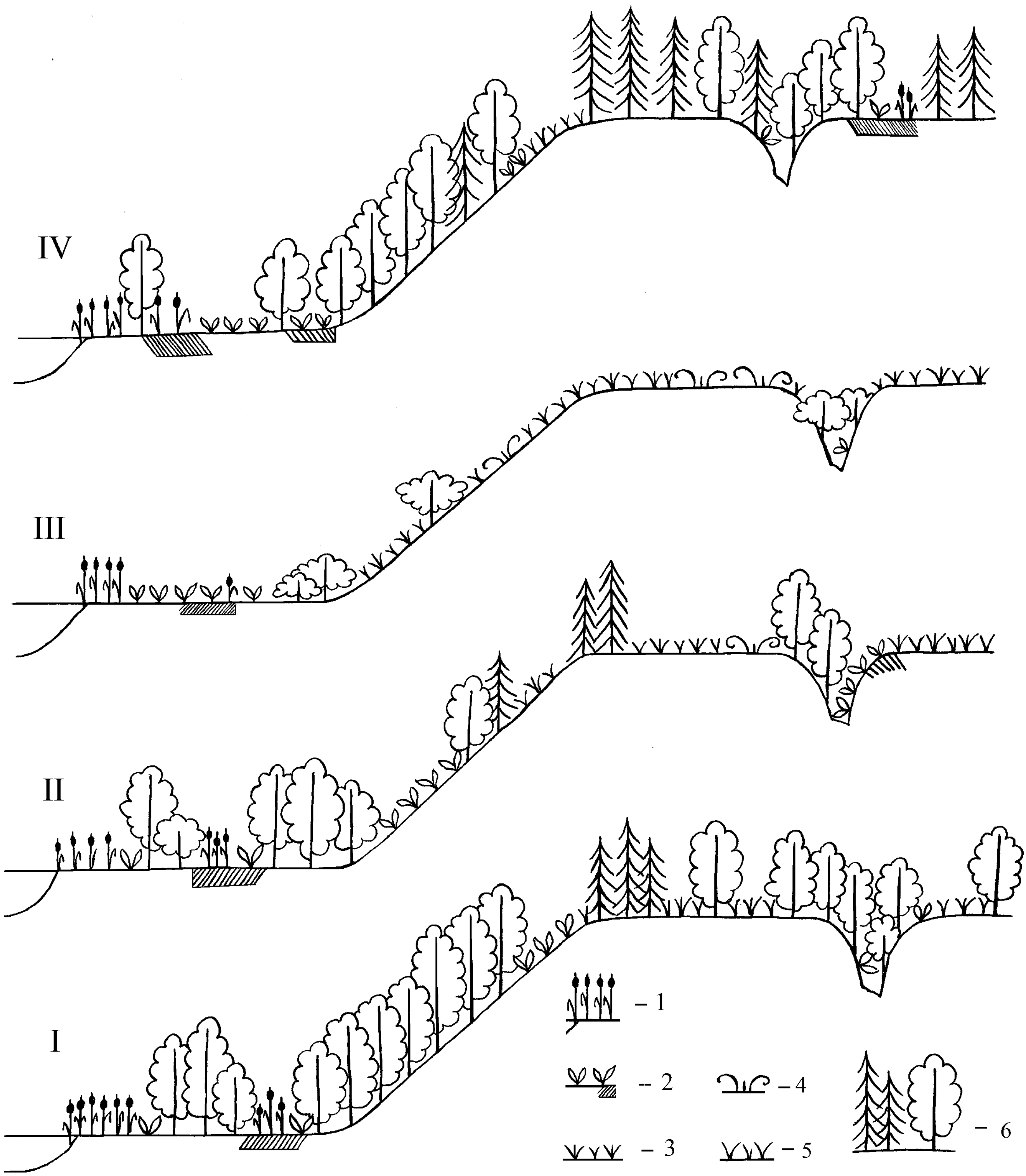

Fig. Spatial regrouping of ecological associations under the influense of climatic changes

I – Mikulinsky time, II – Early Walday, III – maximum of Walday glaciation, IV – Holocene ecological associations of biota: 1 – association of wet biotopes of river valleys, 2 – meadow, 3 – periglacial tundra-steppe, 4 – semi-decert association, 5 – holocenic steppe association with comparatively lower taxonomic diversity, 6 – forest association

UPPER PLIOCENE LAND MOLLUSKS OF BASHKORTOSTAN AND ADJECENT TERRITORY

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Information about the Late Pliocene Land Mollusks of the Bashkortostan are limited by data from the monograph about Symbugino section (1977) and by the material collected by N.B. Verbitskaya in 1966. The nearest to the Bashkortostan the Land Mollusks site of the same age in situated in the Uralsk town region (Aksuat), where Mollusks were collected by Kolbutov (Steklov, 1967) and by V. S. Zazhigyn in 1987. I have the material from the Nikolo-Postupalovo and the disposal. About the Land Mollusks from the Symbugino referent section I can judge only by the monograph devoted to the section description (1977).

In Symbugino section (1977) Land Mollusks have been found in the Lower Aktschagyl deposits (12 taxa), in the Middle Aktschagyl (*Succinea pfeifferi, Euconulus fulvus, Ifigena sp., and Helicella sp.*– recent species), and also in the Upper Aktschagyl (*Ifigena sp., Helicella sp. and Strobilops costata*). From the Lower Aktschagyl (Karlaman and Kumurly suites) 15 Land Mollusks species of seven genera have been determined. The main complex species are recent and close to recent *Vallonia,* Pliocene *Vertiginidae* and *Carychium*. Most of the Mollusks are the inhabitants of soft forest bedding/ leaves and are distributed at the territory of warm moderate climate. Unfortunately, it is necessary to note that the species described and figured in the work (1977) do not correspond to their names, and often it is very difficult for specialist to conclude the shell of what taxa the authors have dealt with. So, *Strobilops costata* Clessin (1977, p. 114, Tab. XXXVII, 8, 9) forms belong to the *Eostrobilops* Pilsbry genera and, probably, are straight off sprigs of Northern Caucasus Late Sarmatian – Meotic and Meotic Priasovye *S. caucasica* Steklov. *Vertigo substriata* Jeffreis (p. 115, Tab. 37, fig. 10) do not has the sculpture on definitive turns, which are characteristic for the species. Probably, it belongs to the ordinary *V. antivertigo*, but forms represented on Tab. XXXVIII, 1–2, are the typical representatives of *Gastrocopta* Wollaston, 1878. The first form is very like to be the representative of the group *G. (Albinula) acuminata* Klein or *G. (Sinalbinula) hartmutnordsiecki* Schlickum, bigger Pliocene group. The second form belongs to the group of *G. (Sinalbinula) serotina* Lozek. Probably it could be *G. huttoniana* Benson. Slim *Carychium* (p. 115, Tab. XXXVIII, 4–7) with well-developed palate teeth belong to the recent group of *Carychium tridentatum* Risso or fossil of *C. plicatum* Steklov.

Carychium ex gr. *tridentatum* Risso, *Gastrocopta (Sinalbinula) huttoniana* Benson, *Vertigo (Isthmia) modesta* Say, *Strobilops (Eostrobilops)* ex gr. *caucasica* Steklov ssp. nov., *Vallonia pulchella* Müller, *V. excentrica* Sterky, *V.* ex gr. *Costata* Müller (large form), *Punctum pygmaeum* Drap., Clausilliidae (two species), *Discus* sp., fragments of Enidae, Zonitidae*, Helicoidea* are have been determined from Nikolo-Postupalovo section.

Aktschagyl Land Mollusks complex is distinguished definitely even taking into consideration the fact that the Bashkortostan Land Mollusks have not been collected and studied specially. It is characterised by the presence of recent species and their nearest ancestors, and also by the group of specific Pliocene species and Miocene relicts (*Gastrocopta*, some *Vertigo* and especially *Strobilops*). From this point of view the Bashkortostan Land Mollusks complex is quite comparable with the complexes of the same age from the Verhniy (Upper) Don, the Northern Kazakhstan and even from the Northern Caucasus.

In the conclusion the list of Middle Aktschagyl land mollusks of the Aksuat is given: *Succinea oblonga elongata* Sandb., *Carychium minimum* Müll. and three new species of this genera, *Cochlicopa* sp. (large form), *Gastrocopta (Vertigopsis)* sp. nov. (not described), *G. (Albinula)* ex gr. *acuminata* Klein, *G. (Kazachalbinula) zamankulense* Steklov, *G. (Sinalbinula) huttoniana* Benson, *Vertilla angustior*

Jeffreys, *Vertigo (Vertigo) pusilla* Müller ssp. Nov., *V. (Vertigo) antivertigo* Drap., *V. (Vertigo) asiatica* Steklov (sp. nov. not described), *V. (Isthmia)* ex gr. *modesta* Say, *V. (Angustula) uralica* Steklov et Krasnenkov, *Truncatellina cylindrica* Fer., *Pupilla pseudotriplicata* Steklov sp. nov. (not described), *Pupilla* ex gr. *muscorum* L., and also three species of *Vallonia* and the fragments of not less than five-six taxa, which are the same of Bashkortostan Aktschagyl complex. This complex is more hygrophilous, but it shows that the special works on Land Mollusks collection and preparation may give the new material as qualitatively.

NEOTECTONICS OF THE URALS

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The time span between the Oligocene and nowadays is commonly accepted as a neotectonic epoch. As for the Urals, it is usually thought to be a time when the modern Urals mountains were formed.

The modern Urals is a mountain range with Narodnaya mnt. (1885 m above sea level) of the Cis-Polar Urals as a highest point. The highest mountain in the Southern Urals is Jaman-Tau (1640 m). Compared with the Uralian foldbelt which used to be a huge mountain ridge in the Late Paleozoic, the modern Urals is a narrow and much less prominent, low-amplitude feature. Paleozoic Urals was formed as a common orogen, at plate boundaries. The modern Urals is an interplate, intracontinental structure. It follows faithfully the strike of the most important "weak" tectonic zones, faults and massifs of the western part of the Paleozoic Urals, and only in the Southern Urals most of the Paleosoic structural zones are exposed, while in the North the easternmost zones experience a submergence under rather thick cover of the West Siberian basin and therefore experience not neotectonic uplift but oppositely, submersion.

The Paleozoic Uralian orogen was a result of collisions started in the Late Devonian and completed in Permian time. It was strongly eroded and partially peneplained by the end of the Permian , when a considerable eastern part of the Southern Urals was invaded by the Tethyan transgression. Triassic was time of a strong basaltoid trapp magmatism, and therefore a new phase of mountain building of that epoch was probably connected with a distributed rifting. The altitude of the Early Triassic mountains is thought to be 2-3 km, while Triassic graben-like depressions are filled with coarse-grained sediments and basalts, up to 3.5 km thick. The sediments in the East of the Urals are partially affected by the Early Jurassic Old Cimmerian thrust and fold deformations.

The mountains were eroded again very soon after that last alpine-type deformations. Since the second half of the Middle Jurassic, the sea started to come periodically very close to the Urals from the southwest, though the most of the territory was a place of either a slow erosion and weathering or formation of continental coal-bearing sediments, including mature quartz sandstones. During the peaks of the vast Late Cretaceous (Santonian-Maestrichtian) and mid-Eocenian transgressions, the sea covered the Preuralian foredeep, southern part of the Uraltau antiform and Zilair synform with Sakmara allochthon, and a major part of the Transuralian zone. It is evident that by that time the Uralian foldbelt was inactive. The surface of its axial part was probably above the sea, though not very high, taking into account the quartz composition of sandstones and presence of weathering crusts and bauxites.

Before the Oligocene the sea left the territory of the Urals, and Oligocene and younger sediments are continental and mostly terrigenous. This scenario (though in a very general way) is supported by recent fission-track data. These analyses have given an information concerning low temperature history of rocks in the Ural Mountains. It was shown that cooling through the 110 ºC temperature isotherm occurred mostly in the Jurassic. Taken as a whole, the data means that the rocks which are now exposed in the surface were in Jurassic (and locally in Cretaceous) at the depth about 2.5-3 km. It leaves the question when in the later history these 2.5-3 km were eroded, still unanswered.

The modern altitudes of the Upper Cretaceous and Mid-Eocene marine deposits in the Southern Urals give the lower limit (minimum value) for the amplitude of the neotectonic uplift of the territory. These amplitudes are below 200 m in the Transuralian zone, about 400 m in the Sakmara allochthon, up to 500 m in the southern part of the Uraltau antiform, and again below 200-300 m in the Preuralian foredeep. The pre-neotectonic Cretaceous /Eocene denudation levels of those territories of the Urals where the transgressions did not reach, had still higher altitudes, though it is very difficult to say how higher they were. There is some evidence for the active high-amplitude faults during the neotectonic stage with the amplitude up to 100-200 m. Paleomagnetic studies of the Late Pleistocene deposits in the Yuruzan-Ai and Magnitogorsk depressions have shown a presence of local young plicative and disjunctive dislocations. Systematic monitoring of tectonic noises have shown their concentration along some old faults in the Southern Urals. The modern researchers attribute a great importance to strike-slip movements in the Urals.

The relief of the Southern Urals is a combination of ridges and mountain massifs with relics of rather smooth denudation surfaces and lower plateaus. The relief around the highest mountains is a combination of narrow ridges with relics of plains at the altitudes up to 1300 m and U-shaped valleys clearly suggesting their glacial origin in Pleistocene, though good descriptions of moraines in the Southern Urals are still not published.

No marine fauna to date the denudation levels in the higher part of the Urals had been found. According to some authors, the ranges and massifs dominating over the level of peneplained watersheds of the Urals mountains have a relic nature and originated as a result of erosion of the Triassic peneplain. This point of view has no direct proofs and conflicts with the fission-track data telling that about 3 km-thick mass of rocks was eroded above the samples taken at the altitudes up to 500-700 m since the Jurassic time. In this case, even Jurassic peneplain had no chance to survive. More realistic guess could be Late Mesosoic or even Cenozoic age of it. The existence of Late Cretaceous marine straits connecting the eastern and western seas surrounding the Urals land suggests that the modern Urals as a single continuous mountain chain was formed only in Cenozoic.

The lithology and facies of the sediments of the neotectonic stage bear their own information on the character and development of neotectonic processes. Oligocene in the Urals is preserved in the Preuralian, Orsk-Tanalyk and Transuralian zones and is represented by quartz sandstones, siltstones and clays of alluvial and lacustrine nature. The thickness is up to 50 m. Miocene in the Preuralian zone is represented by Preuralian series developed in karst depressions situated above the Kungurian evaporites and constituted of quartz sands, silts, clays, sometimes conglomerates, up to 300-350 m of total thickness, with coal seams. In higher places of the zone Miocene is represented by lacustrine and alluvial terrigenous sediments. In the Late Miocene after the accumulation of the Preuralian series a period of an intense erosion started, though it is hard to explain it by an uplift of the territory. Oppositely, it was due to a messinian-like event of a great depression of the Kaspian sea (lake) level. The valleys of Belaya and Ural river were eroded down to 100-200 m below the modern sea level, while the depth of the Caspian sea level was at –550 m. Meanwhile, due to the uplift of the Urals the upper reaches of these rivers have not so anomalously downcut valleys. In the central part of the Urals, Miocene is sporadic; in the area of Beloretsk it is also represented by the coal-bearing sediments of the Preuralian series; in other places, lacustrine and alluvial sediments are predominant. In the Transuralian zone, erosion was predominant, and only locally deluvial and eluvial-proluvial red-coloured sediments were accumulated.

Pliocene in the Preuralian zone was a time of filling up of the downcut river valleys. First it were coarse-grained alluvial-lacustrine sediments; they changed upwards by less coarse silty-clayish Akchagyl sediments with marine fauna, up to 120 m thick. Due to rise of the Kaspian lake above the normal level, the ingression of brackish waters far into the river valleys took place. In the Central Urals Pliocene is represented sporadically in erosional depressions by red-coloured alluvial, deluvial-lacustrine sediments (clays, silts, gravel and pebble boulders. For the first time, the sediments are clearly polymictic which witnesses for the acceleration of erosion. In the Transuralian zone Pliocene is represented by thin differently coloured clays, some sands, gravel and pebble.

The Quarternary sediments are characterized by a greater role of coarse-grained, polymictic deposits of alluvial, alluvial-deluvial and fluvioglacial sediments. Most of the river terraces are dated as Qarternary.

Analysing the sedimentological data, the author comes to the conclusion that the tectonic activity was accelerating through the neotectonic stage towards the modern time.

The modern tectonic activity of the Urals shows in many other ways. First of all, the intense movements of the Earth's surface were proved by the repeated topographic levelling. The velocities of the surface uplift are up to 5 mm/year which is by 10 times more than needed to make the Urals mountains since Oligocene.

The Urals is known for its seismicity. Some strong and even destructive earthquakes were recorded during the historical period. They are concentrated mostly around the protruding salient of the Russian Platform, which is acting as an indenter. The measured maximal stress directions in the Middle Urals are oriented perpendicularly or slightly oblique to the structural grain of the Paleozoic basement. The intraplate stress resurresting some "weak" zones is probably responsible for the modern deformations and uplift of the Urals.

USE OF AMPHIBIAN AND REPTILIAN REMAINS FOR STRATIGRAPHIC CORRELATIONS OF EAST EUROPEAN LATE CENOZOIC DEPOSITS

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The herpetofauna stability in late Cenozoic, recognized by the European experts, obviously, excludes it stratigraphic use. Böhme has offered the circuit, according to which it is possible to define a stage of a climatic cycle on consecutive occurrence of some modern species during interglacial. It would be desirable to note, that this circuit will not work in the majority of regions, because it is based just on species, which can not occur simultaneously on the large territory.

The interglacial phases are defined much more reliable in connection with the directed and consecutive change of natural zones observed in each rhythm. A final glacial stage and initial interglacial stage differ by the greater dryness from final interglacial stage and initial glacial stage. Thus, the change of natural conditions within a climatic rhythm occured in the following sequence: xeromorphic steppe – forest-steppe – foliage and mixed forests – dark-coniferous forests (taiga) – cold forest-steppe (tundra). This sequence could be simplified according to the geographical location of the district.

The palaeoenvironment reconstructions are carried out on the basis of a quantitative ratio of the species remains related to various ecological types. It gives the idea of prevalence of these or those biotopes and, as a consequence, of an existed natural zone. The reconstruction of a natural zone gives the information about both the landscape and climatic conditions, and mainly – about the interglacial stage.

In my opinion, it is possible to define larger stratigraphic intervals too that is connected with herpetofauna instability. Cold blood ground vertebrata with witch one can come across in a fossil herpetocomplexes structure can be divided into three groups: 1 – extinct forms; 2 – the modern species, areas of which do not include now the examined territory; 3 – modern species living nowadays on the territory being examined. The findings of these or those forms, which are not living now on the investigated territory, are determining facts for the conclusion on the concrete age. The modern species specify a fauna position within the climatic rhythm.

The tendency to reduction of the existing forms number on the East-European plain is observed from Pliocene to the present. Thus, herpetofauna was in the past considerably more diverse than it is in the present. This variety gradually decreased because of extinction of one kinds and change of areas outlines of the others. The boundaries of occurrence and disappearance of the various forms from the East-European plain territory can be used for stratigraphic correlations.

A number of the forms can be used as stratigraphic criterion already now. Findings of *Mioproteus* sp., *Eopelobates* sp., *Liventsovkia jucunda*, *Bufo planus* and the plenty of Colubrinae are connected with Upper Pliocene deposits. *Pliobatrachus* cf. *langhae* and new species of grass-snake (not described yet) existed in Europe up to muchkapian interglacial. Findings of Caucasian toad are known from Pliocene – Middle Neopleistocene localities. Mongolian toad was a usual species in steppe and forest-steppe communities up to Likhvin interglacial. Findings of green toad have become massive in Late Neopleistocene and it replaces Mongolian toad in East Europe.

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THE PLEISTOCENE GOLD PLACERS OF THE EASTERN SLOPE OF THE SOUTHERN URALS

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The researched region is located on the western limb of the Magnitogorsk Megasinclinorium, in the centre of the Khudolaz syncline.

There are known alluvial and slope (galley) gold placers.

The productive series of these placers located in the valleys of the rivers Big Kizil and Khudolaz is presented by followed composition of the deposits: sandy-pebbled, sandy-gravelly-pebbled, argillo-rubbly-pebbled (the placers Sultanovskaya, Gadelsha); argillo-pebbled, sandy-clayey, rare loam-rock debris (the placers Zarya, Sunar-Uzyak) and pebble-argillo-rock debris (the placer Daryvdy). The loose sediments are of the Middle Neopleistocene and Upper Neopleistocene – Holocene (Fig. 1).

The bedrock with sinks and bench was formed by clayey crust of weathering, argillo-rock debris and rock debris eluvium and is presented by volcanic – sedimentary deposits of the Irendyk and Ulutau Suites of the Middle Devonian, Koltuban and Zilair Suites, Mukas Horizon of the Upper Devonian.

The mineralogical analysis of the loose sediments has been showed that heavy fraction concentrates presented by following variously rounded minerals: pyroxene, amphibole, epidote, garnet, leucoxene, tourmaline, sphene, magnetite, ilmenite, hematite, limonite, chrome-spinellids, pyrite, chalcopyryte, sphalerite, pyrrhotite and zircon. Sources of the load for these minerals were different. Often samples contain spheroids of the native iron and native cooper, platinum and zinc. In the native gold composition Ag, Cu, Fe, Ni, Zn, Cr, Hg, Pt, Pd, Rh, Ir occur.

The minerals of the platinum group are presented by native alloy of Pt–Fe and Ru–Os–Ir.

Quartz prevailed in the light fraction and feldspars, carbonates occur.

Figure 1. The stratigraphic position of Quaternary gold placers

System	Superdivision	Division	Link	Horison	Index	Position of the placers			Lithology (thickness, m) Genetic type			
Quaternary	Holocene	Holocene	Modern	Holocene	IV				Lacustrine deposits. Sand, sandy clay, bench gravel, brownish-yellow mud (2-5)	Lacustrine-swampy deposits. Mud, peat, sandy clay (0,5-4)	Biogenic deposits. Brown-grey peat with detritus, interbeds humic clay with interbeds of sands (0,5-1,5)	Industrial deposits. Sands, pebbles, rock debris (0,5-10)
	Pleistocene	Neopleistocene	Upper		III-IV	□□□ □□□ □□□	□□	□□□ □□□ □□	Alluvium. Argillo-sandy-pebbled, sandy-pebbled-rubbly brown and grey deposits, polymictic bench gravel. Sandy loam, sands with interbeds of sandy and humic black-grey muds and detritus. Bluish-green and greenish-grey clay (1-6)		Slope deposits. Light grey carbonated loam, clay with admixture of sand, gravel, rock debris (0,5-3)	Alluvium – slope deposits. Loam, brown and brownish-grey clay. Argillo-sandy-rock debris (2-4)
				Hanmeysky	III	□□□□			Alluvium. Loam, sandy loam, sandy and carbonated dark brown clay. In the lower part of the section - sandy-gravelly, pebbled polymictic deposits with interbeds sandy greenish-grey clays (1,5-3)			
				Streletzky								
			Middle		II-III				Slope deposits. Loam, greish–brown clay with rock debris and carbonated concretions (1-7)		Lacustrine deposits. Dense, sandy, carbonated, greyish–brown clay with iron-stainid and manganese. In the lower part of the section - with admixture of the polymictic gravel, rock debris, pebbles (29)	
				Leplinsky	II				Alluvium. Greyish-brown and yellowish-brown clay with rock debris (4-7)		Alluvium – slope deposits. Greyish-brown sandy clay rock debris with pebbles and carbonated concretions (3-22)	
				Nitzinsky								
				Vilgortovsky		□□□□□ □□			Alluvium. Sandy-pebbled and rubbly- pebbled deposits with clayey rusty-brown filler. Quartz-silicic pebbles are rouded with crusts of carbonate (0,5-8)			
				Sylvetsky								
					I-II				Lacustrine deposits. Brown carbonated clay with iron-stainid and manganese (13-40)			
			Lower		I				Alluvium. Sandy-pebbled and rubbly- pebbled deposits. In the upper part of the section - with interbeds black-grey muds(18,5)		Alluvium – slope deposits. Dense, sandy brown clay, iron-stainid, manganese, carbonated, with interbeds of bench gravel and rock debris (2-15)	

THE MINERAL COMPOSITION OF THE PLIOCENE SEDIMENTS IN THE VALLEY OF THE RIVER BIG KIZIL, EASTERN SLOPE OF THE SOUTHERN URALS

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The Upper Pliocene sediments arranged in a valley of river Big Kizil apply to the Kustanai Suite (N_2 *ks*).

Pinus (6,7 – 27,6 %), *Betula* (5 – 24,1 %), *Ulmus* (5,2 %) and *Tilia* (1 %) presented in the pollen spectra of this series. Herbage steppe make up 66,5 – 87,8 %.

Following genetic types could be distinguished in the suite sediments: alluvium, slope deposits, alluvium-slope.

The alluvial deposits located unimportantly; gravelly-pebbly sediments with brown sands and grayish-brown clays present them. Clays are viscous and dense in the upper part of the section. Thickness of the Kustanai Suite is 4–20 m.

The slope deposits located in the river valleys and presented by viscous brownish-red sandy clays with carbonate concretions. Thickness of sediments is from 3 to 7 m.

The alluvial-slope deposits are widely spreaded in the area. They make up the ancient galleys and the valley slopes. The sediments presented by brown and reddish-brown dense sandy clays with iron and manganese. 30–60 % badly rounded pebbles and rock debris make up the lower part of the section. Thickness of sediments is from 2 to 28 m.

We collected samples from Pliocene deposits (the Kustanai Suite) in valleys of river Idyash and creek Ursukov (tributaries of the river Great Kizil).

Following minerals presented in heavy concentrate due to the quantities-mineralogical analysis: pyroxene, epidote, amphibole, zircon, garnet, leucoxene, magnetite, ilmenite, hematite, limonite, chrome-spinellids and rare pyrite.

THE GLACIATIONS AND INTERGLACIATIONS IN THE CENTRE OF THE EUROPEAN RUSSIA

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The deposits of seven glaciations and seven interglaciations are revealed and examined in the Centre of European Russia in Neopleistocene (Middle and Upper Pleistocene); their correlation is represented in following table:

General scale		Isoton-oxigen stage	Regional subdivision		Polarity	Glacial and interglacial deposits
Neopleistocene (Middle and Upper Pleistocene)	Upper NeoPleistocene (Upper Pleistocene)	2	Ostashkovo		B r u n e s	_____________Ostashkovo glacial
		3	Leningrad			Leningrad megainterstadial
		4–5d	Kalinin			?
		5e	Mikulino			Mikulino interglacial
	Middle Neo - Pleistocene (Late Middle Pleistocene)	6	Moscow			Moscow glacial__________________
		?	Chekalin			Gorky interglacial
			Kaluga			______________ Vologda glacial
			Likhvin			Likhvin interglacial
	Lower Neopleistocene (early Middle Pleistocene)		Oka			Oka glacial ______________
			Muchkap			Muchkap (Roslavl) interglacial
			Don			Don glacial __________________________
			Ilyinka	Upper		Sukromna interglacial
				Middle		Setun glacial ______________________
				Lower		Okatovo interglacial Akulovo interglacial
			Pokrovka			Likovo glacial ______________
			Petropavlovka		Matuyama	
Eopleistocene (Lower Pleistocene)						

NEW POLLEN RECORDS FROM THE KEY SECTION ROXOLANY (SOUTHWESTWERN RUSSIAN PLAIN) AND ITS CORRELATION WITH CENTRAL ASIA DATA

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New palynological characteristics for the upper part (0–27 m) of the key loess/soil section Roxolany / Nikoni (Brunhes reversal), located in the Dniester lower reaches (Dodonov et al, 2001) are received. The most complete palynodata characterise the Holocene, Bryansk, Mezin, and Vorona palaeosol deposits and some intermediate loess horizons.

During the formation of the most ancient of the investigated palaeosols – Vorona soil, associated with the Muchkap Interglaciation, four phases of the vegetation development are determined: 1 – (earliest) – *Betula-Carpinus* forest and forbs meadow steppes; 2 – *Picea-Pinus-Quercus* forest with the participation of thermophilic broadleaf trees (*Liquidambar, Ulmus, Morus, Acer*) and forb meadows; 3 – *Betula-Carpinus* forest and Chenopodiaceae forb steppes; 4 – (finishing) – *Picea-Pinus* forest with mesophyllous broadleaf trees (*Tilia, Corylus*) and *Artemisia*-Chenopodiaceae steppes.

The overlying loess deposits (24–12.1 m) formed during a long time from the second half of the Middle Pleistocene and prior to the beginning of the Late Pleistocene, have a complex structure and, probably, significant breaks of sedimentation. In these deposits the Middle Pleistocene paleosol horizons (Inzhava, Kamenka, and Romany) known in other loess sections on the Russian Plain, were not reflected; therefore it is difficult to determine the age of this loess horizon by palynological data. Forest steppe landscapes dominated during the loess sedimentation. Forest ranges were represented by coniferous-birch coenoses with broadleaf trees. *Artemisia*-Poaceae steppe and meadow vegetation associations occurred in open spaces. Continentalization and aridity of climate are recorded. A sharp change of the palynospectra structure at a depth 12,1 m indicates a probable break in this loess sedimentation horizon.

The lower part of the Mezin soil and the uppermost one of the underlying loess horizon were formed in the conditions of forb-steppe landscape domination. The phase of climatic optimum of the Mezin pedocomplex corresponding to the Mikulino Interglaciation was presented by the widespread of forest coenoses. The final stage of the pedocomplex formation occurred in colder climatic conditions.

The pollen spectra of the overlying pedocomplex loess deposits show the domination of forest steppe and cold steppe vegetative communities.

The soil formation during the Bryansk Interstade (32–24 th.yr. B.P.) occurred in the cryoxerophytic conditions with a wide distribution of the forest steppe, *Artemisia* – Chenopodiaceae and grasses-forbs steppe. Birch, pine and hornbeam were the main components of forest coenoses.

A further climate cooling of the second part of the Valdai epoch was reflected in the widespread of vegetation communities with birch participation and *Artemisia*-Chenopodiaceae steppes, which were gradually replaced by forbs-meadow steppes of the postglaciation time.

So, the basic vegetation types during the loess/palaeosol sequence formation of the Roxolany / Nikoni section were represented by forest steppes and steppes, which floristic structure changed depending on the climatic fluctuations from extra glacial steppes of the Valdai glaciation to forest steppes, consisting of coniferous-broadleaf forests and forbs meadows of the interglaciations.

The pollen spectra of loess horizons differ by the greater contents of *Artemisia, Betula,* Poaceae, and Plumbaginaceae pollen, considerable quantity of *Tilia, Corylus*, and *Carpinus-Betula* pollen grains.

At the same time the reduction of birch pollen, the more various structure of coniferous, and the increase of Chenopodiaceae, Dipsacaceae, Cruciferae, *Echinops*, Polygonaceae, Valerianaceae, and varied pollen, characterized the palaeosol pollen spectra.

The upper pedocomplex horizons were formed in comparatively cool conditions.

Palynoanalysis of the Middle – Late Pleistocene loess/palaeosol sequences of Darai Kalon section (Tajikistan) shows the same trend in the distribution of pollen and spores grains in loess and palaeosol horizons (Dodonov, Simakova, Golieva, 1999).

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MACRO AND MICRORHYTHMS IN DEVELOPMENT OF EARLYNEOPLEISTOCENE VEGETATION OF PLATFORM UKRAINE

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In the result of detailed palynological studies of Lower Neopleistocene deposits for six sections situated within borders of the Dnieper upland, lowland and the Northern Donetsk plain, the macro and microrhythms were reconstructed in development of the Early Neopleistocene vegetation for the studied regions.

The macrorhythmics appeared in alternation of the vegetation of the warm stages (soil forming) and the cool ones (loess forming).

The microrhythmics appeared in changing the character of the plant cover in limits of the separated warm and cool stages of Neopleistocene.

Typical definitions for four microrhythms in development of the Lower Neopleistocene vegetation (two of them are for the warm stages and two are for cool ones) were established.

The regional distinctions of the character of the plant cover for established microrhythms in limits of the Dnieper upland; lowland and the Northern Donetsk plain are traced. For each of microrhythms responsible for the period of soil forming three microrhythms characterizing the time of forming two soils optimal and final stages for soil forming as well as two microrhythms for the period of forming loess-like interlayer among them were established.

Microrhythms for the earlier optima distinguished more general participation in the plant of arboreal associations, and in their composition – of hygrophilous plants.

A distinguished peculiarity of microrhythms for the later optima was increase of the meadow-steppe associations with wide diversity of grasses in the plant cover, as well as the variety of the taxonomic composition of the forest conenoses, especially due to broadleaf and thermophilic plants. Microrhythms characterizing the final stages of soil forming differ by predominance of the plant association of impoverished composition: depending on the geographical and geomorphological position of coniferous, oak-coniferous, birch-coniferous forests, as well as herb associations with Asteraceae and Chenopodiaceae.

Though the vegetation of the intervals corresponding to the upper loess-like clays separating soils of optimal stages is poor, it is still similar to the vegetation of the climatic optima. The taxonomic diversity of the vegetation corresponding to the time of the upper loess-like loams separating soils of the optimal and terminal stages is similar to that of the vegetation of the later stages of the loess formation.

Thus, it is probable that the evolution of the vegetation of the periglacial zone of Ukraine in the Early Neopleistocene was gradual. Taxonomic changes in the associations during the stages started their formation at final stages of preceding micro rhythmic oscillations, which manifested themselves during the formation of the intra-soil loess-like loams.

CARNIVORA OF THE TAMAN FAUNAL UNIT (THE ASOV SEA AREA AND CAUCASUS)

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The Taman faunal unit was distinguished by Gromov (1948) and placed between the Psecups and Tiraspol faunal complexes in the stratigraphic scale of continental deposits of southern Russia. The Taman fauna corresponds to the *Archidiskodon meridionalis tamanensis* Biozone. Its time interval is estimated as 1,2 – 0,8 Ma.

The Taman assemblage of large mammals is well known from the Taman Peninsula (Sinyaya Balka, Tsimbal, Kuchugury, Akhtanizovskaya), and from the southern bank of the Taganrog Gulf of the Azov Sea (Port-Katon, Margaritovka, Semibalki, Chumbur Cosa).

There was not a special study of the Taman Carnivora assemblage. The findings of predators were known only as *Canis tamanensis* Verestchagin and *Panthera* sp. from Sinyaya Balka and Tsimbal. Bajgusheva (2000) depicted additionally *Pachycrocuta* cf. *brevirostris* and *Homotherium* cf. *crenatidens* from the material of the Taman level in Semibalki locality.

Actually, recent findings together with the old collections reconsidered allow expanding the knowledge of carnivores of the Taman faunal complex. In the Margaritovka locality the remains of *Canis (Xenocyon) lycaonoides* were identified. The lower jaw of a very large hyena *Pachycrocuta brevirostris* was discovered in Ahtanizovskaya and the mandible of *Lutra* cf. *simplicidens* was received from the Chumbur Cosa locality.

In the neighboring territory of the Transcaucasia, the Akhalkalaki fauna is considered as the analogue of the Taman faunal unit. Carnivores of this local fauna can complete the list of the Taman predators also. There were described by Vekua (1986) as *Canis tengisii*, *Ursus* sp., *Vormela peregusna*, *Meles meles*, *Lutra* cf. *simplicidens* = *Lutra* cf. *lutra* in Vekua (1986), *Pachycrocuta brevirostris* = *Crocuta* cf. *sinensis* in Vekua (1986), *Panthera gombaszoegensis* = *Panthera* cf. *tigris* in Vekua (1986).

As a whole the Taman assemblage contains the same elements that the post-Villafranchian Carnivora complex in Western Europe: *Canis (Xenocyon) lycaonoides*, *Lutra simplicidens*, *Pachycrocuta brevirostris*, *Panthera gombaszoegensis*, *Homotherium*. The small wolf was a common member of the Early Pleistocene mammalian community. Two forms in the studied region represent it. One of them, *Canis tengisii,* resembles well the typical post-Villafranchian small canid – *Canis mosbachensis* from Western Europe. While the type specimen of *Canis tamanensis* has a numerous abnormal features, possibly connected with the pathological changes in the carnassials tooth.

According to Carnivora, the lower stratigraphic limit of the Taman faunal complex is defined by the presence of the advanced form of *Homotherium*. This saber-toothed cat has significant morphological distinctions from a more ancient Middle and Late Villafranchian specimens. The mandible of *Homotherium* from Semibalki does not have a well-developed mental flange as the Villafranchian analogues. It’s the carnassials blade is arched dorsally and the p4 is reduced. The homothers from Untermassfeld (Lower Pleistocene of Germany) and post-Villafranchian specimens from Italy have the same characters.

Unfortunately the upper limit of the Taman faunal complex is unrecognizable exactly on the base of Carnivora analysis. Members of this assemblage have fairly wide stratigraphic ranges in bounds of the Taman and Tiraspol faunal complexes.

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THE MIDDLE VALDAI PEDOSTRATIGRAPHY ON THE RUSSIAN PLAIN JUDJING FROM DATA ON BURIED GULLY SEDIMENTS OF THE LATE PLEISTOCENE

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By the present time, it is established that the Middle Valdai (64–24 thousand BP) that falls in the 3rd oxygen isotope stage is the warmest interval of the last glacial epoch – the megainterstadial. Its complexity is indicative of several alternating periods of warming and cooling. For loess areas of the Russian Plain, these alternations were unknown before, because most studies were performed on "compressed" loess-soil sections of divides and other elevated topographic elements.

In the Late Pleistocene gully deposits of the Russian Plain, the Middle Valdai stratum includes complex loess-soil series. In the Alexandrov quarry (51° N, ° E) that exposes the system of wide flat-bottomed gullies (balkas), there are four Middle Valdai paleosols above the soil of the Mikulino (Eem) interglacial stage. Each of the four is a pedostratigraphic unit with a specific set of diagnostic features. These paleosols are divided by slope deposits and differ from the latter by higher values of the magnetic susceptibility. The lower one is the Kukuev meadow soil developed under forest–steppe conditions. The next upwards is the Streletsk chernozem–meadow soil having the radiocarbon age ≥58700±1900 BP. The next one is the Alexandrov cryogenic meadow soil formed in a cooler forest-steppe. The Alexandrov soil is overlain by clayed lacustrine like loams, which contain bones of a wooly rhinoceros and horse (determined by Dr. Wannenheim). The ^{14}C age of collagen from the horse's bone is 39710±580 BP, which dates the period of a milder periglacial climate and the existence of a watershed lake. The uppermost layer of the Middle Valdai deposits is represented by the Bryansk soil formed at the time of extensive spreading of gramineous-herbaceous steppes; its radiocarbon age is 33140±230 BP. In sections Monastyrshchina and Kalach on the Russian Plain, the Bryansk soil consists of two stratigraphic units. In the Monastyrshchina section, the lower unit has the ^{14}C age of 29100±310 BP, and the upper one — the proper Bryansk soil – 24400±700 BP.

Thus, the Middle Valdai on the Russian Plain is a complex structured period. This is consistent with the concepts of researchers from the Middle and Western Europe and allows us to present the following correlations. The aforementioned paleosols correspond to the interstadials: Kukuev – Kutrussk = Chermensk = Amersfort (67–70 thousand BP), Streletsk — Kishlyansk = Odderade = Brerup (47–62 thousand BP), Aleksandrov – Bailov = Moepsfold =Poperinge (44–45 thousand BP), clayed lacustrine loams that mark periglacial climate warming — Grazhdanskii Prospect = Molodovsk = Hengelo = Podgrad (38–40 thousand BP), and Monastyrsk (33–27 thousand BP) and Bryansk (25–24 thousand BP) — Shtilfrid B = Denekamp = Grand Bua.

TWO PLIOCENE ARVICOLID FAUNAS OF BASHKORTOSTAN WITHIN THE FRAMEWORK OF EUROPEAN BIOSTRATIGRAPHIC UNITS

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Late Academician Varvara Yakchemovich knows two important small mammal associations from the Pliocene of Bashkortostan since 70-s due to remarkable efforts of the Ufa geological team led. The vole faunas of Symbugino and Akkulaevo are reviewed here.

The both faunas are similar in fauna composition and geologic age. The revised arvicolids lists and their correspondence to original determinations of V. P. Sukhov are given in the table below:

Table. Revised arvicolids list of Symbugino and Akkulaevo (lower level)

Akkulaevo **(lower bed)**	Symbugino	**V. P. Sukhov** (1970, 1977)
Mimomys polonicus Kow.	**Mimomys polonicus** Kow.	**Mimomys pliocaenicus** F.Major
Mimomys hintoni Fejfar	**Mimomys hintoni** Fejfar	**Mimomys** cf. **coelodus** Kretzoi
Mimomys hintoni Fejfar	**Mimomys hintoni** Fejfar	**Mimomys gracilis akkulaewae** Suchov
Pitymimomys baschkiricus (Suchov)	**Pitymimomys baschkiricus** (Suchov)	**Mimomys baschkirica** Suchov
Borsodia novoasovica (Topac. et Scorik)	**Borsodia novoasovica** (Topac. et Scorik)	**Mimomys** (Villanyia) **praehungaricus** Schevtschenko
Villanyia veterior Kretzoi	**Villanyia veterior** Kretzoi	**Mimomys** (Villanyia) sp.
–	**Lemmus** (Plioctomys) **mimomiformis** Suchov	**Plioctomys mimomiformis** Suchov
–	**Stachomys** cf. igrom Agadjanian	**Stachomys** sp.

The biostratigraphic position of the localities is defined by the co-occurrence of *M. polonicus* Kow. and *Borsodia novoasovica* (Top. et Scorik). In Eastern Europe this zone is known to postdate faunas of the local zone *Mimomys hajnackensis - Borsodia novoasovica* (late MN16a), and predates faunas of the local zone *Mimomys praepliocaenicus - Borsodia praehungarica* (early MN17).

The both faunas are dated to the second half of Early Villanyian and to the zone MN16b, late Middle Pliocene (Piacenzian). In the national scheme the faunas are referable to the Late Uryv faunistic complex. Among their close chronological matches are faunas of Rebelice Krolewski 1 in Poland (*M. polonicus, P. altenburgensis*), Kushkuna in Azerbaijan (*M. polonicus*), Apastovo in Tatarstan, Russia (*M. polonicus, P. baschkiricus*).

Pitymimomys baschkiricus (Suchov), first described from Bashkortostan, turned out to be a widely distributed European species common to the faunas of early Villanyian. In the phyletic succession of the genus *Pitymimomys* Tesakov, 1998, it is placed between *P. altenburgensis* and *P. tranzendorfensis*. On the basis of hypsodonty of *Pitymimomys baschkiricus* the fauna of Symbugino is somewhat older than Akkulaevo (lower level).

A SEQUENCE OF TEMPERATE AND COLD STAGES FROM EARLY MIDDLE PLEISTOCENE LACUSTRINE DEPOSITS AT DEMSHINSK, LIPETSK DISTRICT, CENTRAL EUROPEAN RUSSIA

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At Demshinsk, south of Lipetsk, lacustrine deposits occupy a small basin in the surface of the Don Till, which is of early Middle Pleistocene age (MIS 16), yet represents the most extensive glaciation in European Russia, probably assignable. A 27 m core has been studied by means of pollen, plant macrofossil, sedimentological and palaeomagnetic analyses. The palaeobotanical record, records three distinct temperate/ interglacial intervals with climatic optima characterised by deciduous forest trees, particularly *Quercus*, *Ulmus*, *Tilia* and *Corylus*. *Carpinus* was present in low-quantity during the first and second temperate periods, but extremely abundant during the youngest. The temperate horizons also contain, amongst other plant macrofossils, the water fern *Azolla "interglacialica"*, long extinct in Europe, but morphologically indistinguishable from the living *A. filiculoides*. Steppic elements, *Artemisia* and Chenopodiaceae, present throughout the sequence, predominated during the intervening cooler intervals; the only significant tree at those times was *Betula*. A further warm interval may be indicated by traces of soil formation in the uppermost part of the core. The pollen records of the temperate intervals are distinct from that of the post-Okian Likhvin Interglacial.

Previously in Eastern Europe, only the two optima within the Ferdinandowian / Belovezha Interglacial Complex of Poland, Belarus and the adjacent Smolensk region of Russia have been recognized between the Donian and Okian glacial Stages. Equivalent Muchkapian Interglacial pollen sequences in the Upper Don region have until now only shown the earlier optimum. Nevertheless, attempts have been made to assign fluvial sequences and their small vertebrate faunas to more than one Muchkapian horizon.

Correlation between the Demshinsk pollen sequence and those from Belarus and Poland are made difficult by differences in the critical record for *Carpinus*. The palaeomagnetic record from Demshinsk, where three minor excursion events have been detected within this early part of the Brunhes Epoch, should help to clarify these problems.

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THE CHUI-ATASEVO SECTION (ILISHEVO REGION, BASHKORTOSTAN REPUBLIC), A KEY-SECTION IN THE DEBATE ON THE *MIMOMYS – ARVICOLA* TRANSITION

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The Middle Pleistocene mammalian faunas in Eurasia can be divided roughly into: a) a group of faunas with a Water Vole with rooted molars assigned to the genus *Mimomys* and b) faunas with a Water Vole with rootless molars referred to the genus *Arvicola*. The first group of faunas have a early Middle Pleistocene age whereas the second group dates to the late Middle Pleistocene. Rooted as well as rootless Water Vole molars occur in a few faunal assemblages; one of these assemblages comes from Chui-Atasevo Section I, layer 8. The occurrence of rooted and rootless molars could be regarded as an indication for a mixed assemblage. However, the species composition of the assemblage does not confirm the mixed character of the assemblage. It rather supports the assumption that the Chui-Atasevo Section I fauna marks the *Mimomys – Arvicola* transition.

A few topics will be discussed during the lecture:

What is the age of the transition?

Does the *Mimomys – Arvicola* transition show a geographical gradient?

What are the taxonomical implications?

How to solve the taxonomical problems?

CLIMATIC MACROCYCLES OF THE CENTRAL EAST EUROPEAN PLAIN THROUGH THE LAST 500 THOUSAND YEARS

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It is well known that global climatic changes became more regular, quasi-cyclic in character within the last million years, since the beginning of the Brunhes palaeomagnetic epoch (780 ka BP). Such a stable manifestation of the climatic fluctuations is attested by the deep ocean record or by ice core from Antarctic.

Of particular value for the Pleistocene climate dynamics understanding are regions where cold epochs were marked by a vast expansion of both ice sheets and permafrost and a reduction of principal landscape zones (hyperzonality), while at warm periods, on the contrary, cryospheric objects shrank and zonal structure acquired a distinct features of latitudinal zonality. In this regard the East European Plain is one of the main key regions on the planetary scale.

Recent researches performed by the Team of the Laboratory of Evolutionary Geography (Institute of Geography, RAS) revealed the structure of climatic macrocycles within the region through the most part of the Pleistocene (the last 500 ka). Five large high-temperature peaks (including the modern interglacial – Holocene) separated by four mean glacial epochs have been detected within this time interval at the central East European Plain; they are correlated with oxygen stages 11,3, 9,3, 7,5, 5,5 and 1 (warm intervals) and 10,2, 8,2, 6,2 and 2,2 (cold intervals).

It follows from studies of subaerial deposits in the region, however, that extreme temperature values of different warm epochs are by no means equal; the same is true of cold epochs. There is a distinct trend towards cooling in every subsequent macrocycle as compared the preceding one. Thus, the maximum cooling (with spectacular expansion of subterranean glaciation and reduced ice sheets) falls precisely on the oxygen stage 2, that is, the last cold stage.

On the whole, curves of quantitative changes of climatic parameters for terrestrial ecosystems are in good agreement with curves of climatic changes inferred from Antarctic ice cores (Vostok station) and oxygen isotope stages identified in the deep-sea cores.

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HUMANS ON THE MOVE: AN OUTLINE OF THE OCCUPATIONAL HISTORY OF LATE WEICHSELIAN EUROPE

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The climatic changes in the last part of the Weichselian (25–10 ka BP) determine the occupational history of the European continent. The two main processes are the retreat of populations of modern humans into southern “refugia” towards the LGM (20–18 ka BP) and the recolonisation of northern regions after the LGM. In this contribution, the main outline of these developments is discussed in terms of geography, chronology and cultural aspects. The focus is on Europe between the Atlantic and the borders of the former Soviet Union.

The baseline is formed by the widespread distribution of the Gravettian technocomplex across Europe (dated between 29 and ca. 23 ka BP). Two of the northernmost sites are Paviland Cave (UK) and Bilzingsleben (Germany). The intermediate period (22–13 ka BP) shows the retreat of human groups in refuge areas in southern France (Solutrean and Badegoulian sites up to the southern border of the Paris Basin), the Middle Danube basin (Hungary and Austria (e.g. Grubgraben in the Kamptal)) and southeastern parts of the Balkans (Roumania, Moldavia). There are a few, more northern sites with evidence for human occupation. The record of Krakow-Spadzista street (Poland) shows several occupation phases between ca. 24 and 17 ka BP, with socalled Kostienki-type shouldered points. The site of Bockstein-Turle (Danube valley, Germany) is dated to approx. 21 ka BP. Wiesbaden-Igstadt (Rhine valley, Germany) is dated to approx. 19–17 ka BP. There is no evidence between 17 and 14 ka BP, except the enigmatic Magdalenian site of Maszycka cave (Poland) with dates of 15,5 and 14,5 ka BP. The evidence from the Hungarian basin and southeastern Balkans is also scarce. The recolonisation of the northern regions after the LGM dates to the Bölling and slightly earlier (from approx. 13,5/14 ka BP) with the Late Magdalenian and Hamburgian traditions. The cold peak of the Younger Dryas may have resulted in the retreat of human groups from the northwestern parts of Europe (Great Britain, Northern Netherlands). The first occupation of Ireland took place only in the Holocene (ca. 9 ka BP) when it was already an island.

The period of 25–10 ka BP saw a number of major cultural changes in Europe. The main field to consider here is hunting technology. The evidence from Western Europe shows the occurrence of spearthrowers from the (Upper) Solutrean (ca. 21 ka BP). Harpoons are introduced in the Late Magdalenian (ca. 13 ka BP). Evidence for bow-and-arrow-hunting is found in Ahrensburgian of Stellmoor (Germany) in the Younger Dryas. A number of reindeer bones contain flint arrowheads and the lakeshore sediments contained hundreds of wooden arrows.

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THE EARLY PLEISTOCENE OF THE NETHERLANDS; STRATIGRAPHIC GAPS AND TRAPS

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The Early Pleistocene stratigraphy is surrounded by a great deal of discussion and controversy. At first there is still the debate where to place the onset of the Pleistocene era. Secondly, the fragmentary continental sediment series from which the NW-European Quaternary stratigraphy has evolved comprises several problems. Overlooking hiatuses and sedimentary gaps has set up several traps for misleading interpretation and correlation. Since the first Pleistocene stratigraphies were made a great number of new data has changed our perception on glacial-interglacial cycles. As a result many of the formerly defined stages appear to show a complex pattern of climate change. Moreover it has been demonstrated that the intensity and duration of the Late-Pleistocene climatic oscillations show marked differences with the Early Pleistocene climatic changes. The now and again oversimplified interpretation of local palaeoecological data into signals of regional climatic significance forms another aspect to be mentioned.

The Dutch chronostratigraphical record of the Early Pleistocene (terms used in the NW-European context where the PP-boundary is placed at the Reuverian-Pretiglian transition at about 2.6 Ma) is often taken as a standard for NW-Europe. This stratigraphy is primarily based on pollen analytical and sediment-petrological data from fluvial sequences. Additional information is taken from the mammalian and molluscan record. It is compiled by data derived from several sections at distinct sites scattered throughout the tectonically complex area of the Roer Valley Rift System. For example, the stratotypes of the Reuverian, Pretiglian and Tiglian are situated on different tectonic blocs of the Peelhorst area and some of them are exposed in excavations. The younger stages, i.e. Eburonian, Waalian, Menapian are defined in boreholes situated in the subsiding area of the Roer Valley Graben. The Bavelian stratotype is located west of the RVG and could be studied in boreholes as well as in excavations.

Mapping programs in the southern part of The Netherlands have resulted in a detailed knowledge of the lithostratigrapy and spatial distribution of sedimentary units. Therefore a re-evaluation can be given for the individual Early Pleistocene type localities. Their sedimentology as well as the fossil content will be discussed.

The main results show that the depositional history of the area has taken place in a predominantly fluvial domain with repeated change of sediment provenance. This fluvial archive contains signals of local as well as regional environmental and climate change. Apart from climate change it has become clear that this sedimentary record is strongly influenced by tectonic movements. The interrelationship between these driving forces is still a matter to be solved.

The pollen record of the up to150 m thick Early Pleistocene sequences in the RVG shows this complex pattern of change, and it has a high degree of consistency. However, the extrapolation to the original stratotypes is still problematic. Nevertheless it is clear that the sedimentary sequences of the RVG may form a major key in understanding the nature of the Early Pleistocene epoch.

STRATYGRAPHY OF THE PLEISTOCENE OF THE CENTRAL EUROPEAN COUNTRIES

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At present in the stage of the evolution of the Quaternary Geology the isotopic-oxygen scales from the oceanic sediments of the North hemisphere have the cardinal chronological consequntation for the characteristic of the nature evens on the territory of West and East Europe. The attachment to the isotopic-oxygen stages with the reliable absolute age allows doing certainly their correlation with the intercountry sediments. The stratigraphical schemes of Belarus, Poland and Ukraine (the data by Ya. Yelovicheva, L. Lindner, A. Ber, B. Vozgrin, A. Bogutskij, P. Gozhik) are more perspective and practical in the accordance of the most number of the variations of the change of the climate and vegetation during of the Pleistocene and Holocene. Their correlation is founded on the opinion about the repeatedly optima and regular successions do the trees vegetation during interglacial epochs, character of the exotic of the fossil flora, rhythmic and cycle of the evolution of the vegetational cover.

If the order of the consecutation of the glacial and interglacial horizon is not cause of the essential disagreements between the authors, that the opinions about the number of the warmers during the interglacials and their rang stay questionable yet: as a climatic optima (from one until three) or independent interglacial epochs, that calls the some uncoincidence in the co attitude their with the isotopic stages. The correlation of the stratigraphical schemes of the three States were the Pleistocene nature events express more representative, shows the next consequtation of the glacial and interglacial:

Stages and Horizons	Belarus (number of optima)	Poland (one optimum is in interglacial)	Ukraine (number of opt.)
1–igl	Holocene (1)	Holocene (1 opt.)	Holocene (1)
2-5a-d–gl	Poozerje	Vistulian	Pricher-Udaj
5-e–igl	Murava (2)	Eemian	Priluki (1)
6–gl	Sozh	Wartanian	Tyasmin
7–igl	Shklov (3)	Lubavian	Kaydaki (3)
8–gl	Dnieper	Odranian	Dnieper
9–igl	Smolensk (1)	Zbyjnian	Potjagailov
10–gl	Glacial-5	Livietsian	Orel
11–igl	Alexandria (2)	Mazovian	Zavadovka–2
12–gl	Glacial-4	Brokian	–
13–igl	Ishkoljdj (3)	Mrongovian	Zavadovka–1
14–gl	Beresina	Sanian-2	Tiligul
15–igl	Byeloveza (2)	15–Ferdinandovian–2	Luben
16–gl	Servech	–	Sula
17–igl	Korchevo (1)	15–Ferdinandovian–1	Martonosha
18–gl	Narev*	16–Sanian–1	Priazovje
19–pregl / igl	Brest	17–Małopolian	Shirokino
20–gl		18–Nidanian	Iljichevsk
21–igl		19–Podlasian / Augustovian–2	Kryzhanovka
22–gl		–	
23–igl		19–Podlasian / Augustovian–1	
24–gl		20–Narevian*	

* Narev glacials in Belarus and Poland have the various ages.

NEOPLEISTOCENE AND HOLOCENE SMALL MAMMALS FAUNAS OF THE SOUTHERN URALS REGION

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V. P. Sukhov (1972, 1976, 1978), N. G. Smirnov (1990) and the author studied the Neopleistocene and Holocene small mammals faunas of this region.

Microtus (Pitymys) gregaloides, Mimomys (Microtomys) pusillus, Mimomys (Cromeromys) intermedius, Lagurus transiens, Myospalax sp. (Tabl. 1) and appearance of *A. mosbachensis* (Chui-Atasevo, section II) have been characterized the Early Neopleistocene faunas (localities: Chui-Atasevo, sections I, II). Species composition has been shown the forest-steppe native conditions. In the Middle Neopleistocene small mammals associations were formed by steppe species – *Lagurus lagurus, Microtus gregalis, Eolagurus luteus, Marmota* aff. *bobac, Alactagulus* sp. and others. *Arvicola* cf. *chosaricus* (locality: Krasnyi Yar) was discovered in the fauna of the Kaluga time. Species, which are, characterized the forest biotopes appeared in the second part of the Middle Neopleistocene – *Clethrionomys* cf. *glareolus, Microtus* ex gr. *arvalis-agrestis* (localities: Klimovka, Gruzdevka). Forest species *Apodemus flavicollis, Clethrionomys rufocanus, Microtus agrestis* and others (locality: Krasnyi Bor) characterized the fauna of the beginning of the Late Pleistocene time (Mikulino interglacial). During the Kalinin cold time *Microtus gregalis* and *Lagurus lagurus, Clethrionomys rufocanus, Cl.* ex gr. *rutilus* (locality: Gornova) are numerous in the forest-steppe faunas.

The Southern Fore-Urals during the Neopleistocene time was the European forest-steppe refugee where during the glacial time steppe and forest species existed. Forest-steppe conditions were a good possibility for the wide faunistic connections between Eastern European and Western Siberian faunas.

On the territory of the Southern Urals the development of the fauna differed from that of the Fore-Urals (Tabl. 2). Associations with *Dicrostonyx simplicior, Dicrostonyx gulielmi, Lemmus sibiricus, Microtus gregalis* and others were spreaded during the Late Neopleistocene (Aratskaya and Ignatyevskaya faunas). In the Middle Holocene fauna (Lemeza) species of the Late Neopleistocene have been reserved (*Dicrostonyx* sp.*, Allactaga major*), but the main part of this fauna consisted of *Microtus gregalis, Ochotona* sp.*, and Lagurus lagurus. Clethrionomys rufocanus, Cl.* ex gr. *glareolus-rutilus, Microtus agrestis* were not numerous (locality: Nukatskaya, Lemeza III). Species of steppe, forest and meadow biotopes (locality Lemeza II) characterized the Middle Holocene (Atysh fauna) – *Microtus gregalis, Lagurus lagurus, Clethrionomys* ex gr. *glareolus-rutilus, Cl. rufocanus, and Microtus agrestis.* In the Late Holocene (Sym fauna) the part of steppe species decreased: *Lagurus lagurus, Cricetulus migratorius* and *Spermophilus* sp. were rare. In associations of the end of the Late Holocene these species disappeared (localities: cave Ustjevoi, cave Gumerovskyi, cave Ziganskyi, Lemeza I) and the fauna consists of modern species of small mammals, which are exist, in the mountain part of the Southern Urals.

Table 1. Neopleistocene faunas of small mammals of the Southern Urals region

Species	Neopleistocene					
	Lower		Middle		Upper	
	Chui-Atasevo 1	Chui-Atasevo 2	Kaluga	The second part	Mikulino	Kalinin
Talpa sp.		++			++	
Sorex sp.		++			++	+
Lepus sp.		+			++	
Ochotona sp.	++	++	+	++		++
Spermophilus sp.	+	++	+	+		+
Marmota sp.				++		
M. aff. *bobac*			+			
Gliridae gen.					++	
Sicista sp.	+			++		
Allactaga sp.		+	+			
Alactagulus sp.			+	+		
A. ex gr. *uralensis-agrarius*					++	
A. flavicollis					++	
Ellobius sp.				++		+
Allocricetulus eversmanni			+			+
Cricetulus sp.			+	+		
Cricetus cricetus					++	
Cricetus sp.		+				
Myospalax sp.	+	++				
Clethrionomys rufocanus					++	+
Cl. glareolus				++		
Cl. ex gr. *glareolus*	++	++		++		
Clethrionomys sp. (ex gr. *glareolus)*		++		+		
Prolagurus cf. *posterius*	+	++				
Lagurus transiens	++	++				
L. lagurus			++++	++++		+++
Eolagurus luteus			++	++		++
E. luteus praeluteus		+				
Lemmus sp.		+				
Mimomys pusillus	+++	++				
M. intermedius	++	++				
Arvicola mosbachensis		++				
A. cf. *chosaricus*			+			
A. terrestris					+++	+
Arvicola sp.				++		
Allophajomys pliocaenicus		+				
Microtus (Pitymys) hintoni	++	+++				
M. (P.) gregaloides	+	+++				
M. (P.) arvaloides		+				
M. gregalis	++	++	+++	++++		+++
M. oeconomus			++	++		+++
M . ex gr. *oeconomus*	+++	++				
M. cf. *oeconomus*				++		
M. agrestis					++	
M. ex gr. *arvalis-agrestis*	+++	+++		++		
M. arvalis					++	
M. ex gr. *arvalis*				++		
M. ex gr. *malei-hyperboreus*	++	++				
M. ex gr. *malei*			+			

Table 2. The Late Neopleistocene and The Holocene small mammals faunas of the Southern Urals

Species	Late Neopleistocene			Holocene			
	Mikulino	Leningrad	Ostashkovo	Early	Middle	Late	
						The beginning	The end
Talpa europaea				+	+	++	+++
Talpa sp.	+	+	+				
Sorex sp.	++	+	+	+	+	++	++
Neomys sp	+	+	+		+	+	++
Crocidura sp.	+					+	
Lepus sp.	+	+	+	+	++	+	++
Ochotona sp.	++	++	++	++	++	+	
Pteromys volans						+	+
Sciurus vulgaris				+		+	+
Tamias sibiricus							+
Spermophilus sp.	+	+	+	++	+	+	
Marmota sp.	+	+	+				
Eliomys quercinus						+	++
Sicista sp.	+		+	+	+	++	++
Allactaga sp.			+				
Allactaga major				+			
Alactagulus sp.			+				
Apodemus uralensis	+	+				++	++
A. ex gr. *uralensis-agrarius*					+		++
A. flavicollis	+	+		+		++	++
Micromys minutus						+	
Rattus sp.							+
Ellobius sp.				+	+	+	
Allocricetulus eversmanni	+		+	++			
Cricetulus migratorius	+	+	++	++		+	
Cricetus cricetus	+	+	+	+		+++	+++
Clethrionomys rufocanus	+	++	+	++		++	++
Cl. glareolus	+	++				++	++
Cl. ex gr. *glareolus-rutilus*				++	++		+++
Cl. rutilus	++	+	+			+++	++
L. lagurus	++	+	++	++	++	+	
Eolagurus luteus			+	+			
Dicrostonyx simplicior	++						
Dicrostonyx gulielmi		+	++				
Dicrostonyx sp.				+			
Lemmus sibiricus	++	++	+				
Myopus schisticolor	+						
A. terrestris	++	++	+	++	++	+++	+++
M. gregalis	++++	++++	++++	+++	+++	+	
M. oeconomus	+++	++++	+++	+++	+++	++	++
M. agrestis	++	++	+	++	++	+++	+++
M. ex gr. *arvalis-agrestis*				+			++
M. arvalis	++		+	+	++	+++	++

Legend:

+ – rare and very rare (0,9%)

++ – usual (1–9,9%)

+++ – numerous (10–29,9%)

++++ – very numerous (more than 30%)

THE CARPOLOGICAL ASSEMBLAGES OF THE MIDDLE PLEISTOCENE OF LIPETSK AND TVER AREAS

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Within the framework of complex researches of lower part of the Middle Pleistocene of Russian Plain conducted by Unitary State Association "Geosynthes-Centre", on materials of drilling were investigated carpological assemblages from sections in Lipetsk and Tver areas.

The carpological assemblage from the lower Middle Pleistocene deposits in the basic section "Demshinsk" (Lipetsk area). The study of this section as most complete and representative for Muchkap super-horizon of Top Don will be nowadays carried out. The section was studied earlier by Nikitin P.A. (1957) and Dorofeev P. I. (1992), which considered these carpological assemblages as early Quaternary interglacial. The author also allocated an assemblage as an interglacial kind. In this assemblage the plants of a soft moderate climate are submitted. The fossil forms, characteristic for the periods of climatic optimum are marked: *Brasenia interglacialis*, *Azolla interglacialica*, *Salvinia interglacialis* etc. Boreal kinds, characteristic for interstadial floras, are absent. The water and lakeside grassy plants prevail; from wood breeds there is only birch. The examined assemblage is similar with those described by Nikitin P.A. (1957) and Dorofeev P.I. (1992). Nevertheless, it was possible to reveal few species unknown in the site "Demshinsk", including *Potamogeton sarjanensis*. These Pleistocene species is characteristic for Belovezhye interglacial of Byelorussia, to which Muchkap super-horizon of Top Don is correlated. The result of the last research confirms the opinion of Iossifova Yu. I. and Krasnenkov R. V., who correlated these deposits to lower (Pol'noye Lapino) optimum of the Muchkap super-horizon.

The upper Middle Pleistocene carpological assemblage from a section "Pal'nikovo" in Tver area has both interglacial and interstadial features. The plenty megaspores of boreal *Selaginella selaginoides* are marked. There are no remains of the thermophile fern *Azolla*. Thus the fruits concerning, probably, to thermophile *Scirpus mucronatus* are marked. Such neighborhood of diverse elements is characteristic for the post optimal parts of the interglacial (Velichkevich, 1982). Here prevail ground hydrophilic grassy plants. *Selaginella* is absent in the top of the interval containing carpological remains. A few megaspores *Salvinia* and extinct forms are marked here: *Carex paucifloroides* and *Scyrpus* cf. *kreczetoviczii*. These attributes can be specific for a relative warming. Though the structure of an assemblage from the section "Pal'nikovo" is not so expressive, the presence of small number "exotic forms" allows assuming, that it is younger than classical Likhvin floras. It corresponds to opinion of Shick S. M. about its belonging to Chekalino horizon (under the scheme of 2001).

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