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**International Union for Quaternary Research (INQUA)
Section on European Quaternary Stratigraphy (SEQS)
Southern Scientific Centre, Russian Academy of Sciences
Geological Institute, Russian Academy of Sciences**

QUATERNARY STRATIGRAPHY AND PALEONTOLOGY OF THE SOUTHERN RUSSIA: connections between Europe, Africa and Asia

**Abstract volume
2010 annual meeting INQUA-SEQS**

**Rostov-on-Don, Russia
June 21–26, 2010**

**Rostov-on-Don
2010**

GORKAYA BALKA: A REFERENCE QUATERNARY SECTION IN THE NORTH CAUCASUS (KRASNODAR REGION, RUSSIA)

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The section Gorkaya Balka (45°9'22.2" N 41°3'28.4" E) is located in the high, right bank of the Kuban River downstream from Severo-Kavkazskii settlement, in 12 km to the north from the town of Armavir. Main features of geological structure of the Kuban River between Armavir and Kropotkin were studied by several authors, most closely by N.A. Lebedeva (1963). The research team of the Geological Institute RAS and other institution studied this section in 2005–2007, and 2009 (Dodonov et al., 2006). The 36 m thick section represents the interlayered sequence of mostly subaerial deposits. Paleomagnetic study by Dr. V. Tubikhin (Geological Institute, Moscow) revealed the normally magnetized upper part (Brunhes) and reversely magnetized lower part of the section (Matuyama). The M/B boundary is situated in 21 m below the section's top. The upper 20 m of the section contain six paleosols (GB1-GB6). The lower 16 m of the section are mostly composed of silty loams with occasional signs of fluvial sedimentation. Two paleosols are present in this part, in two m below M/B datum, and at exposed base of the section.

In 35.5 m below the top of the section, at the base of a member of yellow-brown layered silts and fine-grained sands, bones of elephant have been excavated in 2005. The spirally bent tusk with a maximal diameter of 109 mm can belong to a younger individual of the southern elephant *Archidiskodon* sp. or to a female of *Mammuthus trogontherii*. At the top of the same member, at the depth of 33 m, remains of small mammals have been collected by screen washing bone enriched sediments. The assemblage contains *Mimomys savini* (n=1), *Mimomys pusillus* (2), *Ellobius* sp. (3), *Eolagurus argyropuloi* (7), *Lagurus pannonicus transylvanicus* (96), *Microtus (Stenocranius) hintoni* (22), *Microtus* aff. *arvalidens* (14), *Microtus* spp. (56), *Cricetus* sp. (1), *Allocrietus* sp. (1), *Cricetulus* sp. (1), *Marmota* sp. (2), *Spermophilus* sp. (22), *Spalax* sp. (6). This fauna belongs to the lower part of the regional zone MQR7 (*Prolagurus pannonicus* – *Stenocranius hintoni*) and corresponds to late Early Pleistocene (Eopleistocene) interval between the Jaramillo Subchron and the M/B boundary. Small mammal fauna was recovered in 11.5 m below the paleomagnetic inversion. The environmental aspect of the fauna indicates the presence of open, steppe-like biotopes.

The lower part of the section in the depth range from 18 to 36 m was palynologically studied. Samples are relatively poor in pollen and spores. Arboreal pollen (mostly *Pinus* and *Alnus*) does not exceed 30 % of the total spectra composition. Dominant is pollen of Asteraceae, Cichoriaceae, Chenopodiaceae, Primulaceae, Caryophyllaceae, Plumbaginaceae, Apiaceae, Brassicaceae, and Rubiaceae. Subrecent

appearance of pollen spectra indicate widespread steppe vegetation. The general composition of spectra below the M/B inversion evidences the presence of wooded (conifer and broad-leaved) and forest-steppe landscapes indicated by pollen of *Pinus* sg. *Dyploxylon*, *P.* sg. *Haploxylon*, *P.* sect. *Strobus*, Betulaceae (*Betula*, *Corylus*, *Alnus*, *Carpinus*). Herbaceous vegetation is represented by *Ephedra*, Asteraceae, Poaceae, Chenopodiaceae, and Brassicaceae. Also present are spores of *Lycopodium clavatum* and *Osmunda*. Paleosol (GB-6) and loess-like loam above the M/B boundary yielded pollen spectra that show a decrease in diversity of species composition. In particular, these spectra lack *Tsuga*, *Carya*, *Zelkova*, and Ericales. In general, late Early Pleistocene (Eopleistocene) and early Middle Pleistocene (Early Neopleistocene) of Gorkaya Balka are characterized by extensive development of forest-steppe landscapes combining meadow-steppe stations and patches of conifer – broad-leaved forests.

The six upper paleosols of the section were studied by a several methods. The first paleosol (GB-1) has grayish-brown color. It is humified and has a poorly differentiated profile. It also does not show signs of cryogenic transformations and low carbonate content. Paleosol GB-1 has a ^{14}C date 18750 ± 1100 BP (IGAN-3725) based on stable fraction of humic acids. GB-1 is interpreted as sod light-colored humic paleosol. It indicates semiarid climatic conditions with relatively fast accumulation of light loess-like sedimentary matrix. The second paleosol (GB-2) level represents a pedocomplex with two superimposed profiles. The upper one is gray, poorly carbonatized profile, whereas the lower one represents a humified soil. The four lower paleosols are characterized by poor differentiation of profiles.

In conclusion, the Gorkaya Balka reference section produces multidisciplinary data on the paleoenvironment of Northern Caucasus in time interval from Early to Late Pleistocene. Variegated subaerial deposits of the high bank of Kuban River in its middle course represent a detailed record of environmental changes in the Northern Caucasus for the last million years.