

Morphostructures and Cenozoic deposits on the right bank of the Kizir River (East Sayan)

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Received 21 November 2006; received in revised form 15 August 2007; accepted 2 October 2007

Abstract

Study of morphostructures and Cenozoic deposits is important for reconstructing the history of the recent evolution of East Sayan and search for buried gold placers. Regional positive morphostructures of mountains with well-pronounced relief stages have been recognized in the Altai-Sayan area. The upper stage is referred to the Cretaceous-Paleogene; the middle one, to the Miocene-Pliocene; and the lower stage is dated at the Late Pliocene-Early Pleistocene. Negative morphostructures are recognized as a chain of intramontane basins and graben-like valleys of the Transbaikalian type. Troughs in the section bottom are filled with Cretaceous-Paleogene clayey crusts of weathering overlain by Neogene-Pleistocene deposits of complex composition. We studied the sections of Cenozoic deposits in the valleys of the Shinda and Verkhnyaya Chinzheba Rivers and made their palynological description.

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Keywords: Morphostructures; buried placers; Cenozoic; East Sayan

Introduction

The study area includes the basins of the lower reaches of the Shinda, Nyrda, and Kaspia Rivers, right tributaries of the Kizir River (Fig. 1), and is of intricate structure: It consists of intramontane basins bounded and separated by East Sayan medium- and low-mountain ridges. The interest to study of Cenozoic deposits is related to the long-term history of gold mining in the region famous for its large primary deposits (Ol'khovskoe, Konstantinovskoe, Distlerovskoe, etc.) (partly worked out) and placers localized along the valleys of the Chibizhek, Ol'khovka, and Kaspia Rivers. Moreover, the region abounds in areal and linear crusts of weathering, which are intermediate between a primary deposit and a placer and are also gold-bearing. Most of gold placers localized in Upper Quaternary and Holocene deposits have already been worked out and repeatedly reworked by gold diggers. Therefore, the present-day topical problem is to search for buried unwashed products of redeposited gold-bearing crusts of weathering. In East Sayan, there are gold placers localized in buried paleo-valley deposits of the Sukhoi Log River and upper reaches of the Tartayak River (Khazagarov, 1965).

Regional morphostructures

The intermediate position of the study area between the areas of intense upwarping (high-mountain part of East Sayan) and medium downwarping (Minusa basins) predetermined its relief structure and Cenozoic deposits. Owing to the neogenic block structure, the area lacks well-pronounced extended ridges but is dominated by isolated mountains and mountain groups (massifs of Mts. Moskva and Molom, Ekaterininskii Ridge, etc.) separated by intramontane basins and abnormally wide graben-like valleys (Fig. 2). The boundaries between the uplifts and basins are distinct, rectilinear, with a drastic change in absolute heights, which evidences the tectonic nature of these structures. The mountains have well-pronounced relief stages indicating an alternation of the epochs of medium upwarping, dissection, medium downwarping, and smoothening of the relief (Fig. 3). Along with the Quaternary downcutting of modern valleys, there is a wavy hilltop surface within ridges and uplifts cut by an intermediate surface forming flattened interfluvial surfaces. The youngest lower stage is composed of valley pediments forming steps of lowered interfluvial surfaces along the valleys of large rivers at the boundaries of medium uplifts and basins. In the upper reaches of rivers of ranks II and III, pediments and modern valleys merge into

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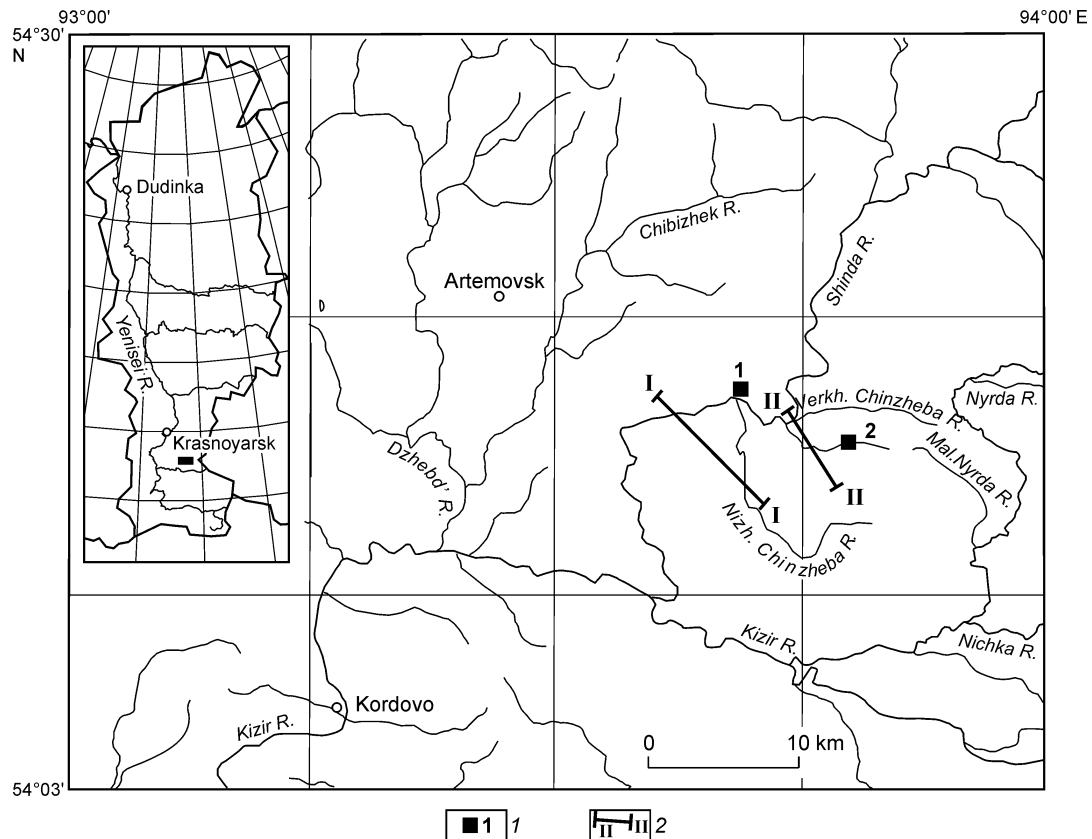


Fig. 1. Schematic map of the study area. 1 — section of loose deposits and its number; 2 — geomorphological profile and its number.

a surface consisting of wide valleys with occasional well-rounded boulders and pebble.

Correlation of fragments of the relief stages throughout the section is difficult because of their particular absolute marks and height difference in separate blocks. For example, the downcutting of the medium stage into the hilltop surface in different uplifts varies from 100 to 250 m, and the downcutting of valley pediments into this stage, from 50 to 150 m, which evidences recent vertical different-amplitude motions of some blocks. The recognized relief stages are regional for the entire Altai-Sayan area (Aleksandrovsii and Matsera, 2005). The upper stage is dated at the Cretaceous-Paleogene; the middle one, at the Miocene-Pliocene; and the valley pediments, at the Late Pliocene-Early Neopleistocene.

Regional negative morphostructures are a chain of W-E striking intramontane basins (Kaspa in the Kaspa River valley, Nizhnyaya (Lower) Chinzheba on the left bank of the Shinda River, and Nyrda in the Nyrda River basin) passing into a system of Minusa basins in the west. This arrangement of morphostructures is due to large faults in the pre-Mesozoic basement, as was reported by many researchers (Obruchev, 1942; Yanov, 1963; Zyat'kova, 1975), who related the distribution and configuration of Cenozoic basins in the Altai-Sayan area to recent tectonic motions, mainly in W-E direction. The Cenozoic basins are partly similar to the Mesozoic ones and are usually set in them and subsided along the faults. The slopes are asymmetric because of the different degrees of young faulting. The basins are rectilinear angular in plan,

which is due to the crossing systems of short and rectilinear faults of different directions, gradual transition of flat bottoms into piedmonts, and well-developed mountainous framing. Ivan D. Cherskii called such basins “basin-like valleys” (Korzhev, 1975).

Abnormally wide graben-like valleys are observed along the Verkhnyaya (Upper) Chinzheba, Badanka, and Malaya (Small) Nyrda Rivers. They are characterized by a well-pronounced linearity and steep, often asymmetric banks and are bounded by tectonic scarps, hanging valleys, and, sometimes, waterfalls (Chinzheba, 30 m high). The mountainous framing is extremely prominent, and the piedmont zone is greatly narrowed or is lacking at all.

Cenozoic deposits

Throughout the recent evolution of the study area, it has been a base of denudation and a sourceland for surrounding uplifts. Their Mesozoic strata are more than 100 m thick. The bottoms of the sections of all basins but the Nyrda one are composed of clayey deposits of residual crusts of weathering (tentatively of Cretaceous-Paleogene age) overlain by thick Pleistocene polygenetic deposits. In the Kaspa basin, there are also products of weathering crusts redeposited in lakes and marshes (Neogene Slyusarev Formation) and on ancient slopes (Eopleistocene Kaspa Formation) (Astakhov and Rakovets, 1972).

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