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Eurasia as the scene of the Late Cenozoic tectogenesis

G.F. Ufimtsev

Institute of the Earth's Crust SB RAS, Irkutsk 664033, Russia

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Abstract This paper attempts to review the descriptions on the genetic series of neotectonic forms in Eurasia. Morphotectonically, the Eurasian continental block exhibits a radial-concentric pattern consisting of four kinds of tectonic units: platforms, rejuvenated and youthful mobile belts, and the continent-ocean transition zones. Vast areas of young and ancient platforms, such as Siberia, have experienced slow-rate Late-Cenozoic uplift and little interior deformation. The youthful orogenic belts are clustered into the giant Alpine-Himalayan megabelt. The rejuvenated mountain belts are characterized by a variety of structural-morphological types of orogens, such as domelike uplifts, block uplifts and intermountain basins. The continent-ocean transition zones in Eastern Asia, including marginal rifts and extensional basins, are resulted from interaction between the continental block and Pacific Ocean and Philippine Sea since the Late Cenozoic. One of the conspicuous features of Eurasia is that most areas lie in the largest geoid depression of the Earth, and the NS trending Uralian-Oman lineament expresses a break on the geoid slope, implying a relationship to deep structure, including density inhomogeneities, downward to the core-mantle interface. Besides, the Eurasian continent fully demonstrates morphotectonic and recent geodynamic features of the Northern Hemisphere of the Earth, just in contrast to that of the Southern Hemisphere. It is best to view the surface morphotectonics and deep structure of the Earth as a geodynamic ensemble which has spawned the large-scale geomorphic features on the surface.

1. Introduction

Eurasia is the largest continental block on the Earth. Its morphotectonic structure includes almost all varieties of recent tectonic units: from the continent-ocean transition zones through youthful and rejuvenated mountain belts to young and ancient platforms. Spatial-temporal combinations and sequences of these units are equally various. Besides, Eurasia is adjoined in the south by Arabian and India subcontinents (Gondwana fragments) or by Mediterranean Sea.

These compositions of morphotectonic (neotectonic) structural elements provide a possibility of studying special types of recent tectogenesis in the near-surface parts of the lithosphere in which (1)

E-mail address: ufim@crust.irk.ru.

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the atmosphere and hydrosphere occupy open lateral and upper half-spaces; (2) the lithostatic load is insignificant; (3) extra amounts of material are transferred from the lithosphere to the area of exogenous processes and (4) density inhomogeneities in the lithosphere have a particular impact on tectonic deformation under the insignificant lithostatic load. These factors suggest a special area for the near-surface tectogenesis whose study requires the wide use of geomorphologic methods because recent tectonic deformations primarily affect the Earth's surface topography (Ufimtsev, 1984; Vita-Finzi, 1986; Embleton, 1987; Summerfield, 1987; Goudie, 1995). The mapping of the tectonic relief and the basement surface based on minimum elevations (an analogue of the plane tangent to the folded surface) allows the study of morphology of neotectonic forms and their structural combinations. The construction of their genetic or evolutionary series (sequences) is the key to understanding recent geodynamics in the near-surface parts of the lithosphere. Such an attempt being made in this paper is based on our earlier structural generalizations of neotectonics of the Eurasian continental block and adjacent areas (Ufimtsev, 1984, 1991, 1998, 2002, 2005, 2008, 2009; Ufimtsev and Shchetnikov, 1999).

It should also be mentioned that the morphotectonics of Eurasia, especially of the Inner Asia, exemplifies numerous hazardous geological processes, whose study may underlay an effective theory for predicting natural hazards.

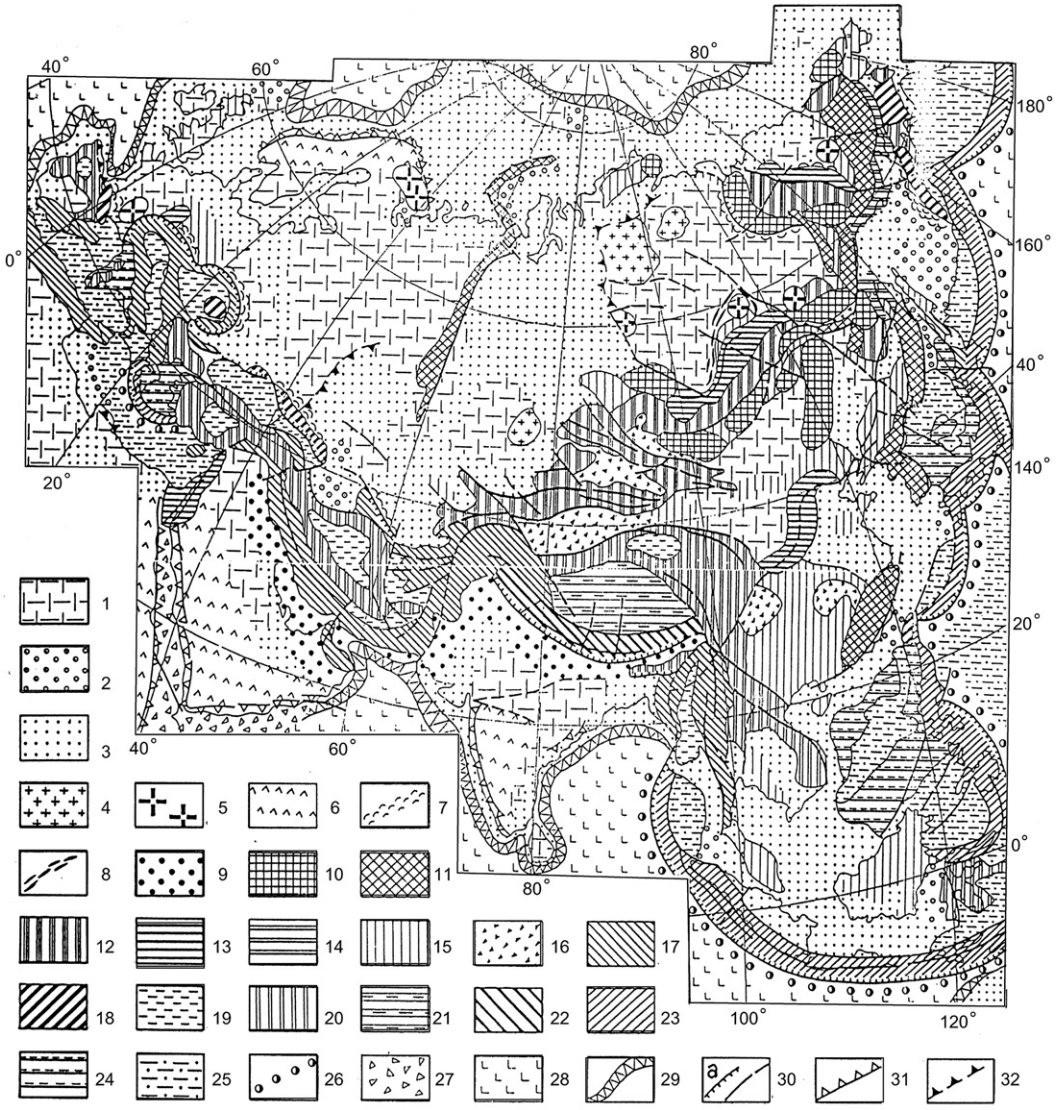

Figure 1 Morphotectonics of Eurasia and its surrounding area. *plain-platform areas*: 1 – general uplifts; 2–3 – general subsidence including intensive subsidence to the avanshelf level and linear troughs (2); 4–5 –arch uplifts including those on the platform margins (5); 6 – marginal-continental oblique block uplifts; 7 – piedmont pediments; 8 – piedmont fold belts; 9 – foredeeps and piedmont depressions; *rejuvenated orogens*: 10 – large arch uplifts; 11 – block uplifts; 12 – arch-block zones of linear warping and tectonic clustering; 13–14 – intracontinental (13) and marginal-continental (14) rift zones; 15 – block fields; 16 – topographically subdued intermountain areas and basins; *young mobile belts*: 17 – folded and overlapped-folded mountains; 18 – arch uplifts; 19 – intermountain areas and large intermountain basins; 20 – arch-block zones of linear warping; 21 –mountains resting on a high socle (Tibetan type); 22 – step-like block uplifts (Himalayan type); *Mediterranean areas and continent-ocean transition zones*: 23 – island-arc uplifts; 24 – continental borderlands; 25 – deepwater basins of the Mediterranean and marginal seas; 26 – deepwater troughs; 27 – intercontinental rifts; 28 – oceanic areas; 29 – continental slope; 30 – lineaments including thrusts; 31–32 – great escarps (31) and their analogues (32).