MODERN GEODYNAMIC SYSTEMS OF THE CENTRAL AND NORTHERN EURASIA

Goltveger, V.J. and Kunina, N.M.

The maps "Modern geodynamic systems in area of the central and northern Eurasia", scale 1:10 000 000, "Modern (Pliocene-Holocene) kinematics of lithospheric plates and crustal blocks in area of the Central and Northern Eurasia", 1:5 000 000, and sketch-map "Trajectories and poles of the plate rotations" were carried out by Goltveger, V.J. & Kunina, N.M. («Aerogeologiya», 1991-1999).

All these maps were elaborated on a basis of data complex: geological deciphering of the air and space images, relief, distribution and morphology of active faults, directions and amplitudes of vertical and horizontal movements, seismic data. Plate-tectonics concept was used as the methodological basement.
The manuscript and all maps are deposited at «RosGeolfound, Moscow»

«Map of recent kinematics … » have led authors to conclusion about existing of three main geodynamic systems on the area of northern and central parts of Eurasian plate. «Geodynamic system» is understood here as the structural ensembles of both platform and orogenic types, formed by the forces having the mutual source and appeared as a result of Eurasian plate movement and its interaction with other plates.

1. The Northern Geodynamic System

The modern tectonics of the northern part of Eurasian plate including polar shelves is resulted from the forces related to the spreading processes in the Northern Atlantic and Polar areas. An emplacement of the pole rotation at the edge of the Gakkel ridge creates peculiar situation of «scissors» – moving apart of Eurasian and North-American plates at divergent part of their boundary accompanied by approaching of the same plates at North-East of Asia. Eurasian and North-American plates ***haven't clear plate boundary*** between southern edge of the Gakkel ridge and place of joining of Aleutian and Kuril-Kamchatka subduction zones.
Spreading at the North Atlantic and Polar areas ***was not compensated in full by* subduction**: it is possible that spreading might be mainly compensated by intraplate deformations that is by formation and/or reactivation of platform type structures at northern parts of East-European and West-Siberian platforms and Barents-Kara shelves. In some zones (Urals-Novaya Zemlya, Taimir, Caledonian thrusts of Scandinavia) level of reactivation corresponds to moderate orogenesis.
At the North-East of Eurasia the lateral shortening in zone of plates approachement is realized as the intraplate orogenesis in the areas between Chukotka Peninsula and Lena-river and modern tectonic deformations at polar shelves of Barenz, East-Siberian, Chukotsk and at least west part of Bering seas.

2. The Southern Geodynamic System

Collision of the Eurasian plate with southern plates (African, Arabian, Indian) results in the orogenesis and formation of Alpine-Himalayan mountain belt (collision zone). The influence of collision forces spreads also on the southern parts of Eurasian platforms; it is presented by platform type deformations and intraplate orogenic (Central-Asian mountain belt) structures.

These forces cause a creation of the recent and/or activization of older structures in southern parts of platforms adjacent to mountain belts (resonance type structures). The width of the periorogenic zones varies widely: they are relatively narrow in Crimea-Caucasus segment of the Alpine belt and about 2000 km wide in the southern part of West Siberian platform.

The Central-Asian belt formation and its specific features are caused by a number of factors, as follows:

- subhorizontal high stress related to plate convergence;
- existence of large rigid block in the north, the Siberia craton, and the system of smaller rigid blocks (Tarim, Ala Shan, Ordos) in the south.

Due to high horizontal compressive stress, the part of lithosphere limited by rigid blocks undergoes lateral tectonic flow (a complex process including mainly brittle deformations in upper crust and predominantly plastic ones at lower levels). Intraplate tectonic reactivation resulted in formation of enormous arch-shaped convex southward megastructure. Its structural pattern witnesses that the axis of outflow of the rock material has submeridional orientation and passes through the southern salient of the Siberia craton.

3. **The Eastern Geodynamic System**

The Pacific plate subduction caused not only formation of back-arc basins, but the deformations of the overhanging plate edges (Kamchatka, probably, Koryok margin of the Komandor fordeep) and thrusts compensating lithosphere tension of marginal seas (Sakhalin, Cihote Alin seaboard) also.

For some regions (e.g., central parts of the East Europian platform, part of the West Siberian platform adjacent to Urals) the question on intraplate stress nature remained undecided. It is possible that the interaction of different stress fields takes place there.

*****

So the authors made an attempt to tie up recent tectonics not only at plate boundaries but also intraplate (both platform type and intraplate orogenesis) in a mutual system with a global plate kinematics and forces coming into existence in process of plate movements and interaction.