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Neotectonic intraplate faulting of the eastern East European craton and the Urals and its relation to collisional stresses come from the southern margin of the Eurasian lithospheric plate

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The Late Cenozoic intraplate faulting in the eastern East European craton, which occurred as reactivation of ancient faults and appearance of new faults, has been known long ago. However a real role of neotectonic fractures in configuration of the whole structure as well as kinematics and dynamics of their formation are not clear so far. Some researchers who proceed from interpretations of satellite photographs and digital elevation maps draw a very dense net of neotectonic fractures and lineaments while others who use detailed geological mapping and seismic profiling data believe that a plenty of supposed platform fractures include few true faults offsetting their walls. A general picture of neotectonic intraplate faulting in the region studied is outlined with emphasis on kinematics and dynamics of fault formation as related with collisional tectonics and fault manifestations in geological and geomorphic structures. The review is based on summarized published data as well as on results of field mesotectonic observations in the Late Mesozoic-Quaternary sequences, which were made to define a kinematic sign of known faults and to reconstruct regional stress/deformation field.

It should be emphasized that a horizontal component of wall displacement occurs in most of the large platform faults proved by geological mapping and drilling, such as Severodonetsk, Manych, Saratov, Zhiguli, Mugodzhary and Loz,va upthrusts. Besides, our mesotectonic studies revealed strike-slip components, i.e. dextral one in the Severodonetsk and Manych faults, and sinistral one for the Zhigouli, Mougodzhary, and Loz,va faults. The detailed mapping and drilling works discovered sinistral and dextral buried strike-slips offsetting swell axes in the West Siberian (near the Transurals) and Scythian young plates respectively. In addition, some strike-slip offsets of drainage systems have been revealed by author in the Zhigouli and Mougodzhary fault zones. At last, low angle neotectonic normal faults occur in framing of the Peri-Caspian syneclise.

The faults with associated folds and swells differ slightly in age but developed predominantly during the Early Miocene-Quaternary interval, i.e. at the time of the northward motion of the Arabian plate. The supposition that the intraplate faulting was affected by the Arabia/Eurasia collision is also confirmed by structural analysis. First, macro-scaled faults of different kinematic signs form a regular structural pattern, with sublattitudinal reverse faults and upthrusts, submeridional normal faults and diagonal strike-slip faults, dextral ones of the NW-SE strike, and sinistral ones of the NE-SW strike. Such an arrangement of faults of different signs points to submeridional orientation of maximal shortening axis and sublattitudinal orientation of maximal lengthening one, which is generally consistent with northward pressure of the Arabian plate which is considered to indent into Eurasia. Second, a similar character of the neotectonic stress/deformation field was also proved by our mass mesotectonic measurements.

Such neotectonic stress field pattern is characteristic for the most of the studied part of the Russian plain. However towards the Urals trajectories of the maximal shortening axis rotate gradually in the horizontal plane where they acquire a sublattitudinal orientation. Judging from major strike-slip and normal faults strike as well as results of the mesotectonic studies, the “Uralian” sublattitudinal shortening was accompanied by a submeridional lengthening. This sublattitudinal compression of the Urals can be explainable by two independent but compatible reasons. First, ancient large-scaled crustal heterogeneity, i.e. the submeridionally oriented border of the East European craton might screen oblique-oriented (in NW direction) collisional pressure come from India, and, second, a position of the Urals in a narrow corridor between the Peri-Arabian and Peri-Indian collision areas where there was little room for escaped masses to be distributed in horizontal plane.

Thus, it may be concluded that the neotectonic intraplate faulting of the eastern East European craton and the Urals was controlled by stresses induced by collisions of Arabia and India with the southern margin of the Eurasian lithospheric plate. The neotectonic stress/deformation field of the entire territory was heterogeneous, and its local variations were due to both the heterogeneous crustal structure of the Eurasian plate formed by the Late Cenozoic and to a certain distance of areas of the intraplate deformations from the nearest source of collisional stresses. Additionally, summary deformation was complicated by non-simultaneous Arabia/Eurasia and India/Eurasia

collisions. As a result, the formation of the Uralian recent structure, which is predominantly related to the latter collision, began much earlier than that of the eastern Russian plain, i.e. in the terminal Eocene instead of the Early Miocene.

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