Geophysical Research Abstracts
Vol. 15, EGU2013-5910, 2013
EGU General Assembly 2013

Neotectonic stress field of the south-eastern East European platform as related to the Late Alpine collision deformation of the Greater Caucasus

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In the south-eastern East European platform and Urals, as well as the young Scythyan platform, the Late Alpine collision deformations are widely spread. First of all, these are crumbled aulacogen covers (the Azov Sea, Dnieper-Donets, and Pachelma aulacogens). In some places the covers were dislocated conformably with platform basements but commonly they were partly detached from it with formation of inversion foldbelts (such as the Donets coal basin in the Alpine stage, Saratov and Kerensk-Chembar dislocations). Basements of some anteclises (the Voronezh, Tokmovo, and Volga-Urals ones) dividing the aulacogens were also involved into deformations. There the greatest upthrusting of basement onto cover can be observed (e.g., the Zhigouli upthrust). In general the thrusting and folding occurred during the Early Miocene-Quaternary, with its periodicity strictly corresponding to that of the Late Alpine tectonic phases in the Greater Caucasus: Early Miocene (the H. Stille,s Styrian phase), terminal Miocene-initial Pliocene (the Attic and Rhodanian phases), Eo-Pleistocene (the Valachian phase). Beside the synchronous occurrences, there are some other evidences of relation of intraplate deformations to the Arabia-Eurasa collision in its Caucasian region: (i) sublatitudinal (up to WNW-ESE strike) orientation of the intraplate upthrusts and folds, (ii) wide distribution of structurally manifested strike-slip zones as well as similarity in orientation and location between the right and left strike-slips considered with those of the Greater Caucasus: domains of the formers are built up to the north the domains of the latters, (iii) directed southward increasing basement involvement into the neotectonic deformations. For example, in the Donets-Azov region a basement neotectonic megafold was imposed not only onto Donets Herzinian foldbelt but also on the Precambrian basement of the Rostov high of the Ukrainian shield. To some extent, this megafold resembles a northern wing of the Greater Caucasian orogen built by an actived basement of the Scythyan plate.

Signs of influence of collisional pressure onto intraplate deformations are also demonstrated by the Cenozoic stress/deformation field studied by the authors by means of mesotectonic measurements of tectonic striation, slickensides and veins in the Upper Mesozoic-Quaternary rocks. As a result, a series of maps of the Cenozoic stress field of the area studied has been first computered. The maps show an orientation and dip of general normal and tangential tectonic stresses as well as a character of a stress regime type (compression, extension, or horizontal shear) determined with the Lode-Nadai coefficient. A combination of the macrotectonic and mesotectonic data allows the following conclusions on dynamics of the platform neotectonic structures formation. (1) In the southern part of the studied platform area (the Zhigouli, Saratov and Kerensk-Chembar dislocations, and Donets coal basin in the Alpine stage), formation of the structures was greatly affected by increasing toward the Greater Caucasus compression in the thrust and strike-slip stress regimes. Horizontal projections of a compression axis in all these areas are oriented submeridionally (up to NE-SW) whereas horizontal projections of an extension axis are oriented sublatitudinally (up to WSW-ESE)). (2) The compression is also growing eastward, to the Uralian-Mougodjary recent orogen but its axis is directed there sublatitudinally, with the extension axis orienting submeridionally. (3) In the right angle between mutually perpendicular domains: the southern (adjacent to the Caucasus) and eastern ("the Uralian") ones, a domain of horizontal extension is present; its axis was oriented both sublatitudinally and submeridionally. In topography this area represents a vast depression, with its centre approximately marked by the point of a confluence of Kama with Volga, the greatest rivers of the Russian plain. There the collision (?) compression also took place but it was only slightly pronounced in the surface (for example, deep-seated folds of the Vyatka dislocations) and, besides, had a stronger disperse in axis orientation. Some prevalence of the NW-SE axis orientation allows conclusion that such compression strike was a result of a geometric composition of two mutually perpendicular vectors of pressure directed from the Greater Caucasus and the Urals. (4) All the results listed above indicate to an essential role of far collision stresses in the formation of the neotectonic structure of the studied platform territory. The collision pressure came predominantly from the Greater Caucasus belonged to the Peri-Arabian collision area as well as from the recent Urals representing presumably the north-eastern "outpost"

of the Peri-Indian collision area. (5) Several discrepancies in the macro- and mesotectonic data in relation of effect of the compression and extension on formation of every platform neostructure (the formers point to more compression environment) are consistent with the idea that these far collision stresses passed at the depth through the consolidated crust whereas upwards (to the earth surface) the collision stresses were partially scattered in the platform cover.