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Oral

Up-to-day crust structure and block motions in central and east parts of Eurasia: joint study

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The division of lithosphere into rigid plates is only first approximation to true hierarchic structure of lithosphere. Already long ago some microplates were identified in the southeast of the Eurasian Plate [1] and in other parts of this lithosphere unit. Joint analysis of seismicity, active faults and velocities of present crust motions of Central and East Eurasia shows that only north half of the continent can be regarded as united relatively stable lithosphere unit, named by authors as the North Eurasian Plate [2]. It is surrounded in east and south by more than 20 smaller blocks and microplates, which reveal more or less independent motions under the action of actual stress field [3,4]. The algorithm of block selection is based on analysis of rigidity of tested unit and on the seismic energy emission on its boundaries [5]. In the geological sense the block rigidity depends on the homogeneity of its structure and degree of its deformation. We reconstructed the model of block motion as a rigid body based on measured horizontal velocities. A block is considered rigid if distinction of modeling and measured velocities is within the limits of ellipse of experimental errors. We have found that South-East China and Indochina-Sunda blocks are nearly rigid. Such blocks as Japan-Korean and Okhotsk can be devoted into two parts. The motion of continental parts of these blocks is well approximated by the rigid block motion model, while the motion of sea parts of them can't be modeled in that way. It can be explained by location of these blocks in zones of active plate interaction. Some blocks in Central Eurasia (Tien-Shan, Tarim, Qaidam, etc) are also strongly deformed under the regional stress field and can't be modeled as rigid blocks. Data of actual motion velocities are also used for analysis of energy dissipation in the area of interaction of Eurasia and India. Considerable deviations of model velocities from measured ones in Himalayas, South and North Tibet undoubtedly arise under the influence of the Indian indenter press. The recent investigations [6] corroborate the intensive deformation of the crust of the mentioned blocks. It seems that the more systematic analysis of these deviations makes it possible in future to estimate a specific distance, in which the influence of collision processes is effective. The depth of earthquake hypocenters distribution in East and Central Eurasia shows the location of blocks' sole within the crust or in the most upper part of the mantle. Such conclusion confirms the idea on lithosphere lamination and lacking of absolute rigidity of large plates.

References:

[1] Yu.G. Gatinsky, *Palaeogeogr., Palaeoclim., Palaeoecol.* **55**, 127 (1986).
[2] D.V. Rundquist, Yu.G. Gatinsky, W.A. Bush and V.G. Kossobokov, *Computational Seismology.* **32**, 266 (2001).
[3] Yu.G. Gatinsky, D.V. Rundquist, *Geotectonics*. **1**, 3 (2004).
[4] G.F. Sella, T.H. Dixon, A. Mao et al., *J. Geophys. Res.* **107, B4**, ETG1 11 (2002).
[5] V. Lyakhovsky, Yu. Tyupkin and V. Vadkovsky, *Algorithms and Result of Data interpretation in WDC.* Eds. V. Golovkov and Yu. Tyupkin. M., VINITI, 11 (1987).
[6] S. Li, M.J. Unsworth, J.R. Booker et al., *Geophys. J. Intern.* **153**, **2**, 289 (2003).