subduction process along the Pacific border. Stress investigation in the continental crust is a very important problem not only for science but also for the practical purposes. There are four main factors which produce tectonic stresses: gravity anomalies of the crust, density inhomogeneities, deformation from area with intraplate collision, residual elastic deformations and underthrust stresses conditions from convective mantle. We present the stress model of the crust and lithosphere for the Central and Southern Asia on the basis of the finite element modeling. For the crust we take the elasto-plastic rheology with Drucker-Prager criterion. In the lithosphere the elasto-plastic model with von Mises criterion is assumed. We investigated stresses which are produced by the crustal density inhomogeneities and surface relief. The calculations are done using the U-WAY finite element code [Vlasov et al., 2004] developed at the Institute of Applied Mechanics Russian Academy of Sciences (similar to the Nastran program). Density inhomogeneities are based on the AsCRUST-08 crustal model [Baranov, 2010], which has resolution of 1×1 degree. AsCRUST-08 was built using the data of deep seismic reflection, refraction and receiver functions studies from published papers. The complex 3D crustal model consists of three layers: upper, middle, and lower crust. Besides depth of the boundaries, we provided average *P*-wave velocities in the upper, middle and lower parts of the crystalline crust and sediments. The seismic *P*-velocity data was also recalculated to the densities and the elastic moduli of the crustal layers using the rheological properties and geological constraints. Strength parameters of rocks strongly depend on temperature, tectonic and fluid pressure. Fluid pressure can reduce resistance forces in faulting rock, tectonic pressure increases these forces.

Results. Isotropic pressure in crustal layer is approximately equal to 0.6—0.8 from lithostatic values, for example 900 MPA on the 40 km depth (Poisson ration changes in the crustal layer from 0.25 to 0.32 in accordance to its mineral properties). In the mantle isotropic pressure practically equals to lithostatic values which corresponds to Poisson ratio 0.5. Lateral pressure variations in the crustal layer are limited by 10—15 % (negative pressure anomaly under Tibet orogen reaches 15 %).

Shear stresses gradually increase with depth and reach approximately 650 MPA in the lower crust under Tibet orogen and 300 MPA on the 30km depth. The models in this work are simplified in several aspects. However our purpose was to compare gravity stresses in the normal continental crust and under Tibet orogen with anomaly thick crustal layer.

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Main tectonic regularity in the structure of continental margins

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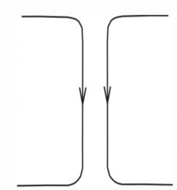
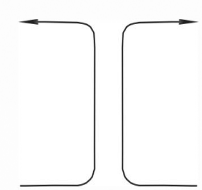
The lithosphere plate tectonics theory describes the process of oceanic crust opening and closure in geological history of the Earth using the Wilson cycle [Keary, Vine,1991]. Upon the end of the cycle the oceanic crust being formed at its early stages is almost completely destructed in the process of subduction. As for the continental margin it is modified during the cycle with formation of volcanic and non-volcanic islands arcs, back- and fore-arc sedimentary basins, and orogens. During the next

Comparison of models evolution of the ocean and continental margins during the complete Wilson cycle

Model of the ocean evolution (Khain, 2004)		Model of the continental margin evolution			
Geosyncline	Plate tectonic «Wilson cycle»	Stages of Wilson cycle	Substage, time (million years)	The course of crust-mantelle substances under the continental margin	Contents of stages
Inland rise (A continental rift)	Continent into pieces; new ocean basin opening	Divergecy	0 Start of forming a new ocean basin		Rifting when continent breaks up
Geosyncline stage	Evolution of new ocean depression, forming deep (15-20km) basin, which is filled in sediments (continental slope and new ocean floor)		200 Ocean widens		Ocean widens. Ocean crust is forming. New quasi-oceanic subocean crust is forming on the place of future continental margin
		Convergency	400 Convergence begins, an ocean plate subducts, creating a volcanic chain at active margin, I orogenic stage		Closing of the ocean basin. Creating a volcanic chain at active margin and subcontinental crust
	First stage of closure the ocean basin, creating of volcanic chain at active margin		600 Thermal subsidence stage		Cooling and subsidence of the mantle diapir when the ocean is closed. Formation of thermal sedimentary basins.
Partial inversion	The ocean basin closes in some part of the ocean depression, two continents collide and began the stage of overthrusting begins	Collision	800 Partial inversion , II orogenic stage		Uplift of the thermal sedimentary basins as a result of dissolution in mantle of cooler lower crust, which is plunging into the mantle
Closing of the ocean basin			1000 Closing of the ocean basin and overlthrusting, III orogenic stage		Overlthrusting of the inversed part of the crust on the passive continental margins and formation of new continental crust
The continent erodes and became a platform		1200 The continent erodes and became a platform			The continent erodes and became a platform

stage of cycle the previously formed continental margin is subjected to deep transformation again leaving in the structure of newborn margin only some relics of the previous ocean crust known as ophiolites. However, as the study proves, complete destruction of the previous continental margin is not reached. Always or quite often it is preserved a significant part of newborn continental crust accreting laterally an existing continental plate and modified during further transformations passing though consecutive stages of states that could be called a vertical line of the tectonostages for particular continental margin. Evidence for that conclusion is an age rejuvenation of the continental crystalline crust while moving from the central parts (shield) towards their outskirts (continental margin). It is proposed the geological timescale of tectonostages derived from the Wilson cycle and established their time boundaries for the last 2500 million years. Along with the developed model for continental margins evolution it allows application of the concept of horizontal sequence of tectonostages transition into vertical and vice versa to study structure of continental margins [Karpenko, Prykhodchenko, 2009]. It is supposed that for the Wilson cycle of 1200 million years every continental margin is subjected to the tectonic process as follows. During the first stage of a divergent epoch (0—200 Ma) a new oceanic basin is forming due to a continental rift. Present-day example of such a rift one can consider the Red Sea Rift and latitude-oriented rift system between North and South America stretched into the Pacific and Atlantic Oceans. Predecessor of the future Red Sea ocean was Tethys and Prototethys paleo-oceans originated during the stages of 590,75—385,75 Ma and 992,5—793,0 Ma ago. The Tethys is corresponding to present-day Alpine-Himalayan orogenic zone and related sedimentary basins, and the Prototethys ones to the Donbass Foldbelt and its eastern prolongation into Karpinskiy Ridge. Rejuvenation of continental margins age towards the periphery of the continents set the problem of studying evolution of those margins applying concept of vertical and horizontal sequences of tectonostages. For this purpose the model of evolution (tectonic stratification) of continental margins is developed. It includes six stages of tectonic evolution: origination of a new ocean and its opening (divergent epoch of the Wilson cycle), stage of the oceanic basin shortening and thermal subsidence (convergent stage), the stage of partial inversion, and the next stage of the complete inversion along with the compression thrusting (collision stage) (Table). Corresponding to the stages is the types of crust being formed (ocean, quasi-ocean, quasi-continental, continental). The stages are divided into geosynclinal and orogenic sub-stages (the Bertran cycle). It is demonstrated that tectonostages and orogenies are matching (Alpine, Hercynian, Caledonian, Baikal and others) for the last 1500 million years. Actually, the features and direction of changes in vertical and horizontal sequences of continental margin tectonostages is a basic tectonic regularity to be studied because it determines existing types of sedimentary petroleum-prone basins, sedimentary complexes and separate prospects considered as hydrocarbon traps.

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Model study of influence of internal stresses on deformation and seismic processes in convergent plate boundary zones by the example of Lake Baikal ice cover

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An important class of problems in mechanics of heterogeneous media (including geological ones) is studying regularities of deformation and destruction of specific quasi-two-dimensional (plate) systems,