

Dynamic segmentation of the active faults and a model of the earthquake focus development in the Tien Shan

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Maps of seismogenic rupture density distribution K_{sr} were plotted for the areas of strong earthquakes (M_{LH} greater than or equal to 6.0) that have been occurring in Kyrgyzstan and adjoined countries since 1970. Parameter K_{sr} was determined based on the modern kinematic theory of solid bodies' strength and experimental data, as well as a new method. Anomalous and inter-anomalous areas are notable on those maps along active fault zones like the Fore-Terskei, the Fore-Kungei, the Fore-Aramsu, the North Karaunkur, the Talas-Fergana, the Main Pamir and the Fore-Kokshaltoo, where dynamic segmentation of active faults took place. We could trace development of segmentation on the maps of cumulative values of K_{sr} of one year spacing, namely expansion of anomalous areas and contraction of inter-anomalous areas. An inter-anomalous area is a kind of barrier to propagation of deformation. Focus fault opening starts in the barrier from the side of anomalous area, where active deformation and frequent weak earthquakes are observed. Magnitude of strong earthquake is determined by distance between anomalous areas, in other words by length of barrier in a segment.

Differential velocity heterogeneities and geometry of active faults in the deep parts of the crust are studied based on the local seismic tomography. A fault along dip consists of several segments of different angles divided by bends and kinks. Focus of the strong earthquake is located close to the segment zone, which in the lower crust is replaced by subhorizontal segment.