

About two phases of preshock stage of the earthquake preparation concerning the Baikal rift zone

Ponomareva E.I.

Institute of the Earth Crust Siberian branch of the Russian Academy of Sciences, Irkutsk, Russia

e-mail: Squirrel@crust.irk.ru

Many of the earthquake focal patterns include four stages: aseismic creep, pre-shock, shock and aftershock ones. Possibility to detail the pre-shock stage is revealed in detailed study of the earthquake preparation within the Baikal rift zone (BRZ). The stage can be composed of two phases: foreshock and calm phases, consistently preceding the onset of shock and aftershock stages. Numerical values of the each phase duration before the earthquake preparation of certain energy class and numerical dependencies were identified [Ponomareva, 2017].

To study the contact interaction of asperities in the slip zone, a concrete slab weighing 625 kg was designed which, under the action of its own weight, slid along an oblique corrugated surface of one of the Angarsk seismically active fault segments at the testing area in the Listvyanka village. During the slab sliding and its moving onto the natural asperities its speed was decreased, sometimes the slab was completely stopped, then at short intervals it sharply accelerated and continued to slide. The slab and asperities contact interaction was accompanied by the formation of seismic oscillations sources, which were recorded by seismic stations and deformometers. As it turned out that the larger asperity was overcome, the more intense were the contact interaction and the occurrence of large amplitude seismic pulses at the acceleration moment. Depending on the asperities strength state on the fault, the seismic sensors recorded the two phases characteristic of the earthquake preparation. Low-frequency oscillations observed during the gravitational chute of the slab are comparable with occurrence of two phases of the foreshock stage: the phase of radiation pulses activation and the phase of calm before the acceleration onset in the form of shock. The slab sharp acceleration after the asperities and high-speed transition of potential energy to kinetic one were considered as an analogy of shock with subsequent attenuation of seismoacoustic emission.

A detailed study of the formation stages of seismic processes of the Baikal ice cover destruction was conducted. A visual study of the ice cover reveals that multi-scale cracks arising from the deformation of ice fields able to emit elastic wave in the form of ice strikes. Before the ice impact in the form of shock, as well as before an earthquake, two phases arise. It was also noted that the beginning of the motion is confined to highly stressed segments of the crack, where there are large asperities. On the basis of the experiments, the following conclusion was made: the preparation of rapid displacement and shock are preceded by two phases in the form of foreshocks and attenuation. According to the data of physical modeling and the considered two-phase phenomenological model of earthquake preparation, the method of recognition of earthquake preparation sites in seismic regions becomes more conscious, where there are biphasic signs of impending preparation of many earthquakes foci.