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On Risk Forecast and Risk Reduction of Tectonic Rock Bursts and Earthquakes

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Avershin, Shrepp, Kvochkin, Bojarkin and others observed that before strong rock bursts, considered as weak earthquakes, for several hours, sometimes for 2-5 days, there occurred spasmodic and sign-variable changes in deformations of rock massif adjacent areas. The works of seismologists Rikitaki, Asada, Isibasi, Matsuda, Saverensky, etc. describe a number of cases of an earthquake before which spasmodic and sign-variable deformations of earth's crust have been observed.

The results of our own experimental research conducted during last decades show that abnormal spasmodic and sign-variable deformations are observed only in rocks having residual stresses. As a rule, these rocks at test after such abnormal deformations collapse dynamically, like explosions, and as a rule, such rocks represent dangerous rock bursts in deposits, located in seismically active areas (Tazhibaev K. Conditions of dynamic destruction of rocks and causes of rock bursts, Frunze 1989). It is necessary to notice that these spasmodic deformations are accompanied by formation and movement of internal discontinuities: dislocations, micro-cracks, and, hence, by redistribution of electric charges in a crystal lattice, and also in the rock as a whole. Redistribution and change in position of electric charges lead to the change of the natural electric potential and intensity of the magnetic field in the rocks massif. Before tectonic rock bursts and earthquakes together with abnormal changes of deformation, the same spasmodic and sign-variable changes of the natural electric and magnetic fields intensity occur.

Based on the above-stated experimental findings, for solution of the problem of tectonic earthquakes forecast, we suggest placing the deformation measuring tool, the magnetic field intensity measuring tool and the device for measurement of natural electric potential along with seismic measurement into the seismic stations. Using abnormal, simultaneous changes of indications of all above listed three devices, based on different physical principles, is a comprehensive approach, which provides a high reliability for forecast of seismic events.

We offer substantiation for solution of the problem of prevention of tectonic earthquakes (Tazhibaev K., Tazhibaev D. Technological measures for prevention of tectonic rock bursts and earthquakes, Bishkek 2007). It consists in definition of experimentally measured stresses and strength of the rocks located in the seismically dangerous zones; in definition of the maximum and minimum values of specific energy of unloading; in stage-by-stage unloading of the stresses, discretely increasing (from a minimum to a maximum) on energy impulses of seismic waves of explosions, consistently and repeatedly made in a dangerous zone through certain time intervals.