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Investigation of the seismic activity under the blasting influence

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The blasting influence on the mine seismicity in the area of the Tashtagol iron ore deposit, Kemerovo Region, Russia is studied. It is found that the b-value of magnitude-frequency relationship for mine seismic events is larger than for natural seismicity of the region. It is shown that the main number of seismic events at the Tashtagol mine occurs during both technological and mass explosions. Maximal rock burst seismic energy release takes place at the time of mass explosions. A time period is evaluated, during which the explosion influences on the seismicity, and which is appropriate to be taken for analysis of blasting aftereffects.The dependences of the duration of activity of seismic events, induced by explosion, their quantity, and total energy on the energy of the conducted explosion are considered. It is shown that considered parameters increase if the blasting power becomes larger. Examples of received relation analysis by their approximation with the logistic saturation function and the power function are given.

The influence of the most powerful explosions on the seismicity is considered also, and evaluation of the seismic energy of the induced seismic events in relation to the seismic energy of blasting is carried out. It is shown that in some cases energy of seismic events followed an explosion considerably exceeds the blasting seismic energy.

A non-linear analysis of natural and mine seismicity of the Tashtagol mine area is made by means of the Grassberger - Procaccia algorithm of an attractor dimension evaluation, based on the calculation of a correlation integral for time series of seismic activity. It is shown, that owing to explosive influence, mine seismicity of the region becomes more deterministic. In other words, the seismic activity state appears after the blasting, when the fractal dimension of the attractor no longer depends on the increasing of the phase space dimension.

Such result corresponds well with results obtained earlier for catalogues of seismic events, registered in the regions of the Northern Tien Shan and Burlykiya River and Uch-Terek River valleys (Kyrgyzstan), where the impact was produced with electromagnetic pulses and chemical explosions, respectively.