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Man-caused seismicity of Kuzbass

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A natural seismicity of Kuznetsk Basin is confined in the main to mountain frame of Kuznetsk hollow. In this paper materials of experimental work with local station networks within sediment basin are presented. Two types of seismicity display within Kuznetsk hollow have been understood: first, man-caused seismic processes, confined to mine working and concentrated on depths up to one and a half of km; secondly, seismic activations on depths of 2-56 km, not coordinated in plan with coal mines.

Every of studied seismic activations consists of large quantity of earthquakes of small powers (Ms=1-3). From one to first tens of earthquakes were recorded in a day. The earthquakes near mine working shift in space along with mine working, and seismic process become stronger at the instant a coal-plough machine is operated, and slacken at the instant the preventive works are executed. The seismic processes near three lavas in Kuznetsk Basin have been studied in detail. Uplift is the most typical focal mechanism. Activated zone near mine working reach in diameter 1-1,5 km.

Seismic activations not linked with mine working testify that the subsoil of Kuznetsk hollow remain in stress state in whole. The most probable causes of man-caused action on hollow are processes, coupled with change of physical state of rocks at loss of methane from large volume or change by mine working of rock watering in large volume. In this case condensed rocks, lost gas and water, can press out upwards, realizing the reverse fault mechanism of earthquakes. A combination of stress state of hollow with man-caused action at deep mining may account for incipient activations in Kuznetsk Basin.

Today earthquakes happen mainly under mine workings, though damages of workings themselves do not happen, but intensive shaking on surface calls for intent study of so dangerous phenomena.

In 2009 replicates of the experiment on research of seismic activations in area of before investigated lavas have been conducted. A spatial displacement of activations along with mine working has been found. An impact of technogeneous factors on behavior of seismic process was investigated. It was demonstrated that industrial explosions in neighboring open-casts have no pronounced effect on seismic process near lavas. Stoppage of mole work in lavas leads to simultaneous changes in man-caused seismicity. The number of technogeneous earthquakes is halved. The earthquakes of small powers remain, but such slack lead to occasional though more strong technogeneous earthquakes.