



Conditions for tectonic fault slow motion transition to stick-slip.

Sergey Turuntaev (1,2,3), Alesya Kamay (2,3), and Alexey Ostapchuk (1)

(1) Institute of Geosphere Dynamics, Russian Academy of Sciences, Moscow, Russian Federation (s.turuntaev@gmail.com),

(2) Moscow Institute of Physics and Technology (State University), (3) All-Russian Research Institute of Automatics

An analysis of data on more than 150 induced seismicity cases (related with dams and hydrocarbon fields) showed that the time delay between the reservoir filling or hydrocarbon production beginning and induced earthquake occurrences varied from 3-5 to 10-15 years. It can be suggested that the main reason in such variety of time delays is related with different tectonic stresses in various locations of dams and developed hydrocarbon fields.

A problem of the induced earthquake occurrences in different stress conditions was studied by laboratory experiments on a slider model. The slider model consisted of two blocks: the fixed block and the moving block pressed one to each other. The moving block was moved by a spring one end of which was moved with a constant velocity. In sets of the experiments, various granular materials both dry and wetted were used to fill a gap between the blocks. The block displacements, shear stresses and acoustic emission were registered during the experiments. Three main modes of the block sliding were detected: stable sliding, stick-slip and unstable chaotical sliding. Transition from one type of sliding to others were correlated with changes in the acoustic emission characteristic features. Moreover, it was observed that in case of unstable sliding, which looks like a superposition of stable sliding and stick-slip modes, the acoustic emission change its characteristics before the stick-slip occurred.

The obtained results were analyzed with the help of one-parameter and two-parameters rate-and-state friction equation numerical studies and their advantages were compared. An application of the revealed differences of the acoustic pulses emission regimes in different sliding modes to induced seismicity in different tectonic conditions allows one to get better understanding of the induced and triggered earthquake preparation processes.