

Seismicity and microseismicity caused by disturbances of underground fluid systems

Turuntaev S.B., Zenchenko E.V., Riga V.Y.

Sadovsky Institute of geospheres dynamics Russian academy of sciences, Moscow, Russia

e-mail: stur@idg.ras.ru

The problem of predicting the reaction of underground fluid systems to man-made impacts is becoming increasingly important due to the widespread development of unconventional oil and gas fields and the implementation of geothermal energy projects that have begun worldwide. In both cases, it is assumed that multiple hydraulic fracturing of formations will be carried out (to increase the flow rates at hydrocarbon deposits, to obtain superheated water, to increase the intake capacity of injection wells). Multistage hydraulic fracturing is the main method of developing shale hydrocarbon deposits, as well as deposits in the Domanikovskaya and Bazhenovskaya formations in Russia.

Along with the problem of forecasting the catastrophic consequences of impacts on the subsurface, in recent years there has been increased interest in the possibilities of using microseismic monitoring to obtain additional information about the geomechanical and hydrodynamical properties of reservoirs, about seismo-deformation and fluid dynamic processes occurring in them. The most widely, the seismic monitoring is used to quickly determine the position of a hydraulic fracture. There are also works showing the possibility of using microseismic monitoring data to assess reservoir permeability. The presented report examines examples of the occurrence of seismicity associated with the impact on underground fluid systems, issues of improving the quality of the data obtained and their interpretation, a model of the occurrence and propagation of seismic events during injection is proposed, examples of the results of calculations based on the proposed model are given.