



Experimental study of seismic oscillation effect on rock sample permeability

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An experimental study with use of a new especially designed setup simulating seismic events by cyclic variations of axial or confining pressure with different amplitude and frequencies was carried out. The experiments were performed at temperature up to 250°C.

It was found that seismic action affects permeability and can lead to its variations.

If under seismic action the confining pressure becomes less than the fluid pressure and rock tensile strength, microcracks develop and irreversible changes in rock microstructure take place. Thus, permeability values increase and remain high after unloading. At high temperatures this effect is reinforced by water penetration into the intergranular boundaries, leading to their erosion.

According to the results obtained, the action of seismic oscillations with energy analogous to the power of the M5 magnitude earthquake at 400 km from its focus may lead to an increase in limestone permeability by 1.2 times. Heating reinforces this effect - at the temperature of 250°C, the permeability of basalts located at the same distance from the focus increased by 2.5-3.7 times.

If cyclic seismic action with high oscillation amplitude is normal to rock foliation, is performed under high effective pressure and long duration, rock compaction, leading to permeability decrease may take place.

Seismic action with 5.0 MPa amplitude and 40 h duration leads to a decrease in limestone permeability by 3.7 times.