

The influence of long-time weak shocks on the evolution of stresses and deformations of geomaterials

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A laboratory device was constructed to study the effect of long-time weak shocks on the evolution of the stress-strain state in cylindrical geomaterial samples. The possibility of impact by shocks with simultaneous loading by torque and compressive force on the sample is realized.

There was carried out study of the effect of long-time weak shocks on the stress-strain state of specimens made from equivalent geomaterials preloaded with static compression. The outer diameter of the samples was 38 mm, the inner diameter was 15 mm, and the length was 115 mm. Samples were prepared from a mixture of acrylic gypsum, quartz sand with a particle size of 0.3 mm and water, taken in a ratio of 100: 100: 28, respectively. Longitudinal deformations of the samples were measured by 4-6 strain gauges with a base of 5 mm located along the sample with an equal step. The resistance strain gauges were glued with BFR-2K glue. Polymerization of the glue was carried out at a temperature of 200 degrees C during 10 hours. The experiments continued permanently during 700–2000 hours. The impact energy was 0.08 J, and the frequency was 2 Hz.

It has been established that against the background of the total compressive strain (creep) of the sample, its portion, which is $1/4$ of the total length and adjacent to the point of impact, is gradually stretched. The compression of the rest sample ($3/4$ length) in the process of weak striking increases. The change of deformation occurs non-monotonously in time, but in the form of oscillations relative to the trend. Comparison of the compression waves phases at different points of the sample shows that the effect of weak shocks initiates the slow deformation wave at a speed of 8 mm / hour .

The initial compressive stress of the sample also decreases non-monotonically. Separate areas of pressure growth and drops are detected. The sample periodically stores and then releases the accumulated energy of the shocks during the entire experiment.

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