SIMULATION OF SLOPE FAILURE UNDER DYNAMIC IMPACT

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This paper discusses the results of laboratory experiments simulating the subhorizontal effect of a low-frequency seismic wave on a slope. It is established that with a single impact on the slope of a pulse with a large acceleration, but with a low velocity, a landslide is not initiated. However, in this case, residual deformations occur, which, accumulating, can lead to the emergence of slope processes.

With repeated exposure to the slope, there is a sharp decrease in the maximum velocity of displacement of the soil required for the collapse of the slope. As the maximum velocity decreases at the same accelerations, the accumulation of deformation occurs more slowly.

Much attention is paid to the movement of the gravitational landslide. To study it, the Newmark model was used, which is based on a scheme where a landslide figure is considered as a rigid block on an inclined surface. The static stability of landslides is analyzed, and the dynamic development of the sliding process is evaluated.

A series of experiments were conducted. The slope model and the block (landslide figure) were located in a massive steel container measuring 40x30x30 cm. The seismic impact was simulated by impacts on the side surface of the container. The displacement of the block was controlled by a laser sensor. According to this series of experiments, the necessary conditions for the occurrence of a dynamic collapse are both a sufficient amount of block displacement and the achievement of a certain creep rate, which in model experiments was 1.5 mm/s.

In the conditions of the metastable state of the sliding mass, the occurrence of slope processes is determined by local factors – small variations in the slope angle, contact inhomogeneities.

Previously, for slope phenomena, the effects of friction reduction were discussed only for large avalanches with volumes over 106 m3. However, according to the results obtained by us, it was shown that the effect of reducing friction with increasing velocity also plays a significant role in the formation of landslide processes of a smaller volume. Establishing the causes of this interesting phenomenon requires further study.