EARTH SCIENCES

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CONDITIONS AND FACTORS OF OCCURRENCE OF MUD FLOWS IN THE LANDSCAPES OF THE CHECHEN REPUBLIC

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Abstract

Mudflow is a spontaneous (especially dangerous) hydrological phenomenon that threatens human settlements, sports and sanatorium-resort complexes, roads, irrigation systems and other important economic objects. The formation of mudflows in the Chechen Republic occurs in the mudflow watersheds. The mudflow, as well as the manifestation of landslides, rockfalls, seasonal floods, hail, are one of the negative natural processes that is manifested in the mountainous regions of Chechnya.

Keywords: flushing, rocks, glaciers, power sources, rain, showers, mud flows.

Fugitive streams are called fast flow channels, consisting of a mixture of water and rock debris that suddenly appear in the basins of small mountain rivers. They are characterized by a sharp rise in the level, wave motion, short-term action (from 1 to 3 hours), a significant erosion-accumulative destructive effect. The mudflow watershed consists of three zones in which mudflow processes are formed and proceed: a mudflow formation zone where water and solid material feed; transit zone (mudflow movement); unloading zone (mass sedimentation of mudflows).

The formation of mudflows in the Chechen Republic is due to a combination of geological, climatic and geomorphological conditions: the presence of mud-forming soils, sources of intensive watering of these soils, and geological forms that promote the formation of steep slopes and streams. The

complexity of orography, hydrography, deposition of atmospheric precipitation and geological structure of the territory, causes a high probability of occurrence of mudflow processes. Humidification of rocks increases their mass and accordingly the action of gravitational forces on them, which is accompanied by a weakening of the strength of structural bonds in them, a change in the consistency of soils to plastic and even fluid. This all leads to a decrease in the strength (friction and adhesion) of rocks on the slope [2].

In areas with a rainfall of precipitation, only a small part of the moisture is infiltrated, and most of it quickly flows down the slope. In the areas of permafrost soils, quick and deep thawing of frozen rocks in spring and summer favors the development of landslide movements: on the slopes of the northern exposure of solfleuklion phenomena, on southern slopes, which, with abundant precipitation, can pass into active mudflows.

Sources of solid feeding of mudflows can be: glacial moraines with loose filling or without it; channel blockages and clutter formed by previous mudflows; wood-and-vegetable material. Sources of water supply for mudflows are: rains and showers; glaciers and seasonal snow cover (during the thawing period); water mountain lakes. For high-mountainous basins with developed modern glaciers and glacial deposits (moraines), glacial mudflows are characteristic. The main source of their solid nutrition are moraines, which are involved in the process of mudflow during the intensive melting of glaciers, as well as in the breakthrough of glacial or moraine lakes. The formation of glacial mudflows depends on the temperature of the surrounding air.

Direct causes of the emergence of mudflows are showers, intensive melting of snow and ice, breakthrough of water bodies, less often - earthquakes. To form mudflows, it is necessary to have: a sufficient number of products of rock destruction on the slopes of the basin; sufficient volume of water for flushing or demolition from slopes of loose solid material and its subsequent movement along the channels; steep slope of the slopes and watercourse.

According to the composition of the solid material to be transported mudflows are usually distinguished as follows: mud flows, which are a mixture of water and fine earth with a small concentration of stones (volumetric flow weight 1.5-2.0 t / m3); mud-stone flows, which are a mixture of water, fine earth, pebbles, gravel, small stones; there are also large stones, but there are not many of them, they fall out of the stream, they again start moving together with it (volume flow 2.1-2.5 t / m3); water-stone flows, which are a mixture of water with predominantly large stones, including boulders and rock fragments (volumetric flow weight 1.1-1.5 t / m3).

The mudflows are subdivided according to the nature of their movement in a channel to connected and disconnected ones. Linked streams consist of a mixture of water, clay and sand particles. The solution has the properties of a ductile substance. The flow seems to represent a single whole. Unlike the water flow, it does not follow the bends of the channel, but destroys

and straightens them or passes over an obstacle. Disconnected (current) flows move with great speed. There is a constant collision of stones, their rolling and abrasion. The flow follows the bends of the channel, exposing it to destruction in different places [1,2].

The villages are classified according to the volume of the transferred solid mass or, in other words, in terms of capacity, and are divided into three groups: powerful (strong power) - with the removal of more than 100 thousand m3 of material to the foot of the mountains, are once every 5-10 years; average power - with the removal of 10 to 100 thousand m3 of materials, there are once in 2-3 years; weak power (low-power) - with the removal of less than 100 thousand m3 of materials, are annually, sometimes several times a year.

Often, very strong (exceptionally strong power) mud flows are emitted, with the removal of more than 1 million m3 of detrital materials; happen once in 30-50 years.

There are settlements that are subject to mudflow hazards, such as Itum-Kale, Borzoy, Dai, Sharo, and others.

According to the morphological type of mudflow in the Chechen Republic, foci of dispersed salt formation prevail (36.0%). Next are cuts and potholes (32.6%), rocky foci (21.2%) and catchments (8.2%). Foci of dispersed mudflow are located at altitudes of 1320-4696 m. The catchment area of the centers is from 0.7 to 32.2 km2, and their average slopes are 13-35 °. Cuttings and ruts are common in the described territory very widely. These foci are located at altitudes of 520-620 m in the Shatoi Basin and 1600-3640 m on the Bokovy and Vodorazdelnom Ridges.

Rocky foci are confined to limestone cliffs and avalanche-slopes of ancient carp and troughs of the Lateral and Watershed Ranges. Their absolute heights are 2 280-3 960 m. Rocky mudflow foci are formed in the upper reaches of the river. Martanka and its tributary r. Meredzhi at altitudes of 1440-2840 m. The centers of dispersed mudflow occur in the basins of the rivers Meredzhi, Gekhi and Martanka at altitudes of 1200-2360 m. Three mudflow watersheds are in the upper reaches of the river. Martanka on the heights of 1480-2840 m. In the upper reaches of the rivers Shondon, Bluhoney, Maistikha, Kerigot, Sharo-Argun, Danailakhi and Hulandoahk, there are glaciers actively receding now, which also contribute to salt formation [2,3].

In places where there are significant slopes of the channels, the presence of loose material or clayey, easily erodible rocks, small nanosoft mudflows are formed, caused by heavy rainfall precipitation. For the development of mudflow, in general, in the mountainous part of the Chechen Republic, hemorrhoidal features are promoted: a straight erosion-tectonic relief with a clear morphological reflection in it of the structural elements of the Montenegrin monocline, disturbed by the newest Neogene folding (anticlinal protrusions and flexures); the relief of the territory is relatively young, actively formed in the confrontation of intense modern uplifts and progressive erosion.

increased precipitation from 800 to 1000 and more mm. in year. Humidification of rocks increases their mass and accordingly the action of gravitational forces on them, which is accompanied by a weakening of the strength of structural bonds in them, a change in the consistency of soils to plastic and even fluid. This all leads to a decrease in the strength (friction and adhesion) of rocks on the slope. With the rainfall nature of precipitation, only a small part of the moisture is infiltrated, and most of it quickly flows down the slope. Also, the formation of mudflows, is associated with anthropogenic activities in mountainous areas, construction and unregulated grazing [3].

Spring activation of slope processes is possible in the cold autumn-winter season, when precipitation accumulates in the form of snow, initially falling to the non-frozen ground. In this case, during spring snowmelt, almost all melt water will be filtered into the ground. Fallout of the same snow on the frozen ground will determine the predominance of surface runoff over infiltration during its spring thaw. There are the following basic patterns of moistening of rocks: the higher the temperature of the air (soil) in the warm period of the year, the higher the evaporation and less rainfall penetrates the slope massif, moistens the rocks and vice versa; Lowering the average daily air temperature below 0 ° C during the cold season results in a sharp restriction or cessation of dispersed groundwater discharge occurring in the lower parts of the slopes at sites of seepage; humidification of near-surface rocks during spring snowmelt occurs as a result of infiltration of meltwater, which is controlled by temperature regimes of air and soil surface, practically identical at this time of year; the higher the air temperature in the period of spring snowmelt, the faster thaws and the near-surface part of the rocks (soil) warms up to a greater depth, and the melting of snow and infiltration waters intensifies, contributing to the moistening of large volumes of rocks compared to cold springs. The water that does not come out begins to fill loose subsurface deposits. This raises the level of groundwater, increases hydrostatic weighing and hydrodynamic pressure. In this connection, the conclusion is unquestionable: the longer the period of negative mean daily air temperatures in the winter, the greater the volume of rocks adjacent to groundwater discharge points on the slope will experience moistening and be prepared for the spring release [4].

The nature of the effect of waterlogging is largely determined by the physico-mechanical properties of the rocks, the peculiarities of their changes when the climate regime changes.

Due to the moisture of the rocks along the cracks, a voltage breakdown occurs, and the slope comes to an unstable state. This dependence is also valid for deep landslides, since when they are wet, the cracked surface absorbs a large amount of precipitation, landslides are activated as a result of intensive saturation of the soils with sediments in the zone of cracks. With prolonged drizzle, the surface of the soil massifs is moistened more evenly due to the long-term effect of these sediments and the insignificant amount of surface runoff.

The melting of the snow cover, occurring relatively slowly, according to the conditions of infiltration into the ground and the formation of surface runoff due to the action of thawed waters, is close to the action of drifting sediments.

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