



Dynamic processes in the mountain catchment

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The process of the river catchment foundation and the mechanisms being in the basis of its development are not clear at present. Principal phenomena determining the dynamics of formation of the river catchment are under our study in this paper for the case of the mountain basin as an example. The methodology of this monitoring includes the space image recognition and computer data processing of the images for the Maliy Caucasus Mountains.

Mountain river catchment formation on the slope of the ridge can be considered as a self-organizing staged process of its evolution passing through several non-equilibrium but steady-state conditions. We consider a system of tributaries in the mountain river catchment as a system of cracks, which are formed on the slope of the mountain massif.

In other words, the formation of river networks should be the result of development of several processes, among of which the mechanisms of crack development should play a dominant role.

The principal results, discussed in the present report, can be formulated as follow.

- (1) The mountain catchment (litho-watershed) formation takes place under conditions of the confined states of a mountain massif: on the one hand it is bounded by the surface of the slope; but on the other hand, – by a primary cracks density occurrence (as a spatial distribution 3D-crack net).
- (2) The development in time of the river catchment takes place by several stages. Each stage specifies a definite energetic state of the system in the mountain massif.
- (3) The overhead river streams arise not only due to surface water, but and namely due to rising of water from underground water horizons over the watercourse cracks penetrating deeply into the underground.
- (4) The 3D-river catchment structure results in concept in behavior of the unit as an open nonlinear dynamic system with a spatially distributed feedback.

The energetic (endogen) processes of formation, rising and bifurcation for cracks are the consequence of relaxation of tension accumulating into of the mountain materials, and result in specific geometrical image of the river stream system. Exogenic processes of depression have a secondary meaning and take part in organization of the relief picture inside of the basin. Geological peculiarities, concrete physic-chemical properties of the mountain massive and different external factors are overlapped on indicated primary processes, and such complicated picture establishes the morphology of the catchment in general.

The conclusion is, the mountain river catchment is the vertical geosystem with the predominantly descending fluxes of substances . Its development in time results in interrelated processes of mountainous massif destruction and, as to direction of the river's channel fracturing growth, the process is going up over the slope.

The water balance in such a 3D -system should take into account both surface water and groundwater.