Mathematical modeling of dynamic and quasi-static processes in the zones of seismic activity

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The mathematical model of the tectonic break in a rock massif under conditions of the emergence and development of a narrow zone of plasticity in its vicinity has been developed. The calculation formulas of evolution of displacements on break and process of development of lines of plasticity are got. The mathematical model of two interactive tectonic break in a rock massif is worked out in the conditions of origin and development of narrow zone of plasticity between them. The terms of complete transition of bridge are investigational between break in the plastic state, the maximum state of undisturbed part of bridge is certain.

The computer visualization of quasistatic processes is presented in the zone of single break in the conditions of origin and development of narrow zone of plasticity in its vicinity: the charts of time development of flowages are presented on continuation of break and charts of speed displacements of breaks on the border of plasticity lines depending on base-line tensions, fluidity limits of material in the zone of irreversible deformations; the epures of maximum displacements are got on a break. The computer visualization of quasistatic processes is conducted in the zone of two interactive tectonic breaks with the zone of flowages on a bridge: the charts of time development of flowages lines are presented to the set point on a bridge and charts of lines of speeds development are built on the border of break on the line of plasticity depending on base-line tensions, fluidity limits of material in the zone of irreversible deformations; the time of complete transition of bridge in the plastic state is certain.

According to the results of mathematical modeling and computer visualization of displacement velocities in the zone of localization of plastic deformations on the bridge between two faults, it is established that the stable zone of the bridge is characterized by the rate of displacement in the plastic zone. For the unstable zone of the bridge, the rate of displacement in the plastic zone is less pronounced, and with active instability the rate of displacement is monotonically increasing.

Mathematical modeling of non-stationary processes in a stressed environment was carried out in the event of a sudden rupture of contacting shores using an analytical solution by Kim A.S. for a dynamic problem simulating the process of an earthquake. For a break with a viscous contact of the shores, the displacement field in the zone of the final break for the first arrivals of seismic waves is obtained. A computer visualization of the development in time of the total field of displacements in the focal zone was carried out, taking into account the field of repeated cylindrical waves, when a complete discharge of stresses occurs on the final break. It is established that on the trunk gap can occur reverse displacement of the banks of the gap.