The variations of geomagnetic field in the region of the Sulaksky cascade of hydro-electric power station

M. G. Daniyalov and A. I. Suleymanov
Dagestan branch GS of the Russian Academy of Sciences

Technogenic intervention in nature while creation of large water basins disturbs developed dynamic balance in rock mass and activates seismic processes, i.e. causes the so-called exited earthquakes which are connected with water basin operation.

Local changes of a magnetic field of the Earth can be the result of various physical processes, but the most probable – electromagnetic and piezomagnetic processes. In our case the rock piezomagnetism is considered to be the principal cause of local geomagnetic variations – change of their magnetization under the influence of mechanical pressure. The measurements were made 2 times a day at the same time to reveal the connection of geomagnetic field components variations with water basin level fluctuations.

According to geomagnetic measurements of 1983-1989 it is determined, that relative changes of a vertical component δ much more exceed respective alterations of the module of a full vector δT that is indirect acknowledgement of magnetoelastic effect under natural conditions.

We determined that in the period of intensive rising of water level and weight the sharp reduction of a vertical component in water basin is observed which depends not only on loading value, but also on filling speed. At stable level of a water basin slight increase of δ is observed which is explained by internal pressure relaxation process in the water basin basis.

The empirical formula for calculation of changes of a vertical component of a field Δ under the influence of loading during the water basin filling is observed. The numerical value of coefficient k,, calculated by the least square method as the interconnection coefficient between vertical component changes and changes of level of the Chirkeysky water basin according to measurements of 1983-1989 is: 5, 66 10-4 nano-tesla / Pa.

Ju. Skovorodkin obtained the numerical value of k coefficient: 6, 3 10-6 nano-tesla / Pa during the variations measurements of full vector module of geomagnetic field on Charvaksky geodynamic testing area.

Comparing these two coefficients, we see that the coefficient for change of vertical component of geomagnetic field on two orders greater, than the coefficient for change of full vector module.

Thus, during the observations of geomagnetic field local variations caused by changes of magnetic properties of rocks under the influence of water basin loading, the most informative are variations of components of a magnetic field, in our case of vertical component δZ.

According to the data of the stations located proximately to the Chirkeysky water basin, the seismic events, which epicenters are in radius of 40 km from a dam site, have occurred on depths from 3 to 9 km, concern to earthquakes of technogenic character, caused by variable loading during the water basin operation. In comparison with geomagnetic observations in 1983-1989 it is shown that basically all seismic events are dated for minima of dispersions of a vertical component of a geomagnetic field that is a prognostic sign.