Radioactive elements in rocks in the valley of the river Mtkvari

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In the present work for the first time it was studied distribution of natural and technogenic radionuclides in some rock samples selected in the valley of the river Mtkvari, in particular, nearby to the settlements Grakliani, Uplistsikhe, Nichbisi, Telatgori, Khidistavi, etc. 12 rock samples were selected in this region. The area is characterized by complex geological structure. In the work using method of gamma-spectroscopy it was studied radioactivity of different types of rocks – magmatic and sedimentary.

By results of the analysis of gamma spectra up to 22 radionuclides were identified in rock samples, in particular: Th-232 family – Ac-228, Th-228, Ra-224, Pb-212, Bi-212, Tl-208 (in total 6 radionuclides); U-238 family – Th-234, Pa-234, Th-230, Ra-226, Pb-214, Bi-214, Pb-210 (in total 7 radionuclides); U-235 family – U-235, Th-231, Th-227, Ra-223, Rn-219, Pb-211 (in total 6 radionuclides); other natural radionuclides – Be-7, K-40, and also technogenic radionuclide Cs-137.

The main features and regularities of samples radioactivity were established, in particular:

- activity ratio U-238/U-235 corresponds to the value of 21.7 (accepted for natural objects); for ratio U-238/Th-232 deviations (more than ±10%) from the average value of 0.81 (for the closed systems) were observed towards increase as well as towards decrease; the similar picture took place for ratios Ra-226/U-238 and Pb-210/Ra-226 where deviations from equilibrium value (1.0) were observed both in the greater way, and in the smaller way;
- radionuclide Be-7 was measured in one sample, and in several sample was measured in trace quantities;
- activity of radionuclides of families and radionuclide K-40 ranged in various samples more than 10 times – from 22.0 up to 1263 Bq/kg;
- technogenic radionuclide Cs-137 was measured in insignificant quantities in 1 sample.

Some features were marked in distribution of activity depending on genesis and type of samples, in particular, average activity of families' radionuclides and radionuclide K-40 in magmatic rocks is appreciable greater in comparison with sedimentary rocks (equivalent activity 199.5 and 76.9 Bq/kg, accordingly), at the same time the big range of activity change in various groups of sedimentary rocks was marked (9.4 - 154.1 Bq/kg).

The analysis of the received results and their some features, and also comparison with reference data was carried out.

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