

Radon Distribution on the Territory of West Georgia

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ABSTRACT

Quantitative assessment of radon distribution in West Georgia has been carried out. According to field data in more than 100 water and soil samples there is high content of radon.

Key words: *Rn mapping, out-door radon.*

Introduction

According GNSF project FN-19-22022 “Radon mapping and radon risk assessment in Georgia” during 2020-year authors carried our field work in order to quantify the radon distribution, ascertain geological factors influencing on the out-door radon concentrations some geographical areas of Central Georgia.

Method

When undertaking the gas Rn survey, the particular attention was paid to the multiple active zones of faults and areas of elevated geo-chemical background of uranium and quicksilver. Mobile group conducted the Radon researches by Alpha-Guard measurement device. Rn content was measured in any type of water source (boreholes, wells and springs) and in the soil aeration zone in several regions of Guria and Imereti. All observation sites were fixed by GPS measurements.

The key method for fulfillment the project is Radon mapping based on application of geochemical methods [1-3]. Connection of anomalies to geological and hydro-geological structures, is analyzed using GIS technology.

Results

Results of analyses on radon concentration were marked on topographic and geological maps. After that the field data were digitized and transferred into GIS-system. On the basis of these data the map of Rn content in water and soil were compiled using GIS technique (Fig.1).

Areas of anomalously high Rn exhalation both in water and in soil were revealed in Tskhaltubo, Kuttaisi, Vani, Bagdadi, Chokhatauri and Ozurgeti regions. In order to understand the nature of these

anomalies it is necessary to analyze all factors that influence intensity of Rn exhalation and lead to high risk of its accumulation.

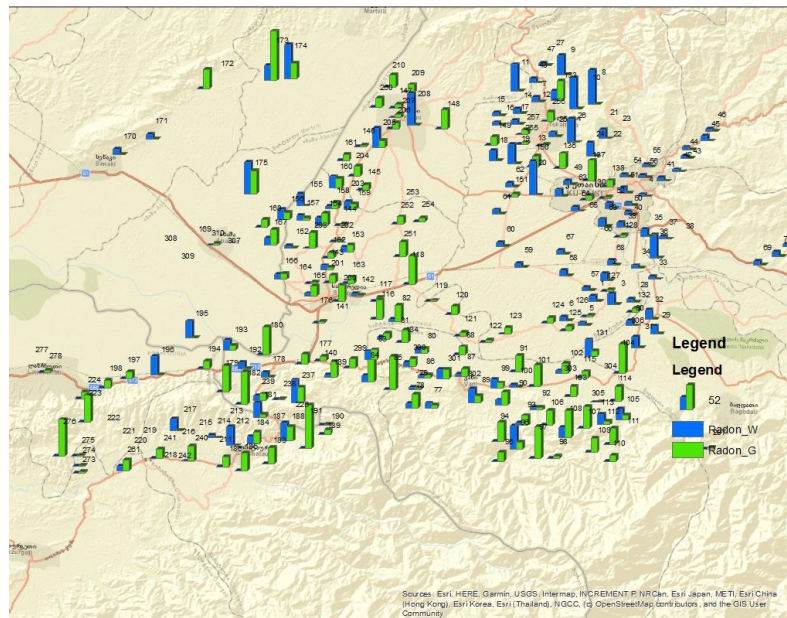


Fig. 1 Sampling points location on the territory.

These factors are lithology and geological structures of the region, presence of tectonic faults, presence of radioactive elements in the rocks, hydrogeological and geomorphological structures of the region, soil characteristics etc (Fig.2).

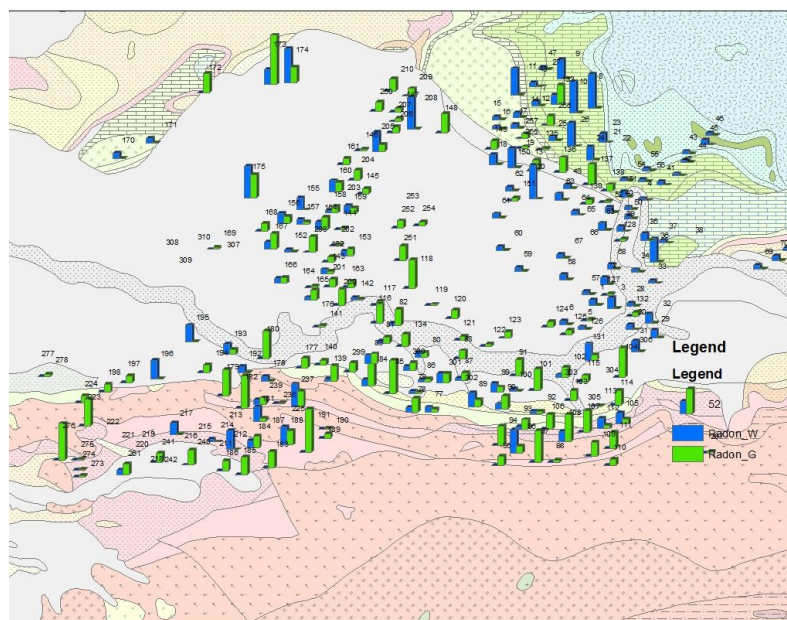


Fig. 2 Radon distribution on the geological map

The Northern and Central part of the tested area belong to the geological point of view to the Kutaisi sub-zone of the Georgian plate and the Southern part – to the Adjara-Trialeti folded system.

On the North territory there are Lower Cretaceous rocks, which contain fissure and fissure-karstic type of pressurized ground water (regions of Tskaltubo and Kutaisi); the characteristic example is the low-radioactive thermal waters of Tskaltubo resort (50-70 Bq/l). Here the springs have large debit (200-220 l/s).

In this area to the north of Kutaisi we found a band of elevated radon content in the soil (22-26 KBq/m³), which should be related to the presence of dikes of the crystalline rocks and systems of faults, developed on this territory. At the same time the content of radon in the water is low, which can be explained by influence of near surface groundwater circulation in this zone.

The recharge of the aquifer takes place in the northern elevated areas; then the aquifer plunge under the Quarternary layers and its discharge takes place at the contact area of Georgian plate and Adjara-Trialeti folded system, where a lot of transversal faults are found. This is also confirmed by the existence in this zone of low-radioactive thermal waters at the resorts Sulori, Amaghleba and Vani.

In the south and south-west part of test area, i.e. in the Adjara-Trialeti folded system (regions of Vani, Chokhatauri and Ozurgeti), in the volcanic and sediment rocks of Middle Eocen we observe karstic-fissure and fissure pressurized groundwaters of low radioactivity. The terrain here is of erosion-peneplain type.

Similar to Tskaltubo region here also are observed high values of Rn content in the soil (22-58 KBq/m³); this can be explained by high gas permeability of rocks and geomorphology of the area. As to the Rn content in water, it is a bit less (16-22 Bq/l) than in Tskaltubo region and cover much less area due to the fact that here mostly the shallow groundwater's are observed; these waters are characterized by shallow circulation system and they are not discharged on the surface (situation is alike to that in the North, where groundwater is in limestone rocks of Cretaceous age).

Conclusions

Peculiarities of distribution of Rn on the territory of West Georgia was studied and anomalous areas were outlined. The elevated exhalation of Rn is the result of draining of Lower Cretaceous and Middle Eocene aquifers by rising springs and boreholes.

Acknowledgement

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რადონის განაწილება დასავლეთ საქართველოს ტერიტორიაზე

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ლ. ჭელიძე, ი. გიორგაძე

რეზიუმე

დასავლეთ საქართველოს ტერიტორიაზე განხორციელდა რადონის გავრცელების შესწავლა. საველე კვლევებით დაფიქსირდა რადონის მაღალი კონცენტრაცია 100-ზე მეტ სინჯში.

Распределение радона на территории Западной Грузии

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Резюме

Было проведено изучение распределения радона на территории Западной Грузии. Полевыми исследованиями зафиксированы высокие значения радона более чем в 100 пробах.