

Comparison of the Distribution of Radionuclides and Heavy Metals in Georgian Soils

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ABSTRACT

Environmental pollution is an undesirable process of loss of substances and energy caused by human economic activities, such as the extraction and processing of raw materials, which is accompanied by the separation and dispersal of waste in the biosphere. The long-term threat of contamination of agricultural areas (decades or more) is associated with a drop in long-lived biologically active radionuclides of ^{90}Sr and ^{137}Cs . The data from the last round of our survey showed that in 2013-2018 the land area we surveyed reduced the ^{137}Cs pollution density to 3.1% on Makhata Mountain. In Gardabani - 5.4%, in Rustavi - 31.9%, in Zestafoni - 55.4%. We will continue monitoring and will offer you the following in new article.

Keywords: Radionuclides, heavy metals, forest brown soils.

Introduction

The natural radioactivity of the biosphere is due to the origin of galactic (GCR) and solar (SCR) cosmic rays and radioactive isotopes (nuclides) - natural radionuclides contained in the Earth's crust, atmosphere and hydrosphere. Natural radiation background is constantly present in the biosphere. V.I. Vernadsky noted the enormous role of element radioactivity in evolution and the existence of the biosphere [1].

Environmental pollution is an undesirable process of loss of substances and energy caused by human economic activities, such as the extraction and processing of raw materials, which is accompanied by the separation and dispersal of waste in the biosphere. A comprehensive tool for studying different anthropogenic impacts on the environment is its comprehensive analysis [2]. In the event of a nuclear accident, adequate protection of society and the Measurement of radiation dose and radioactive contamination in the environment is essential for the optimization and decision-making process of radiation protection. However, in the early phase, such measurements are rarely available or sufficient. environment requires timely assessment of short-term and long-term radiological impacts. To compensate for the lack of monitoring data during nuclear emergencies, especially in the early stages of an emergency, mathematical models are often used to estimate the temporal and spatial distribution of radioactive substances. Which we have used in our works and the relevant results are in the case of Rustavi-Zestafoni [3].

Results

Radioactive contamination of agricultural lands is classified as areas of intensive agricultural production. The long-term threat of contamination of agricultural areas (decades or more) is associated with a drop in long-lived biologically active radionuclides of ^{90}Sr and ^{137}Cs (Fig.2).

Agricultural land in the mentioned district. The study of the natural radiation background of the soils of Gardabani district was carried out, where the highest annual dose was recorded at 120 ng / h, 1.06 mW/year [3,4]. It is known that the so-called The average data of the "normal" regions is 0.7 mSv / year. If we compare this figure with the data of the Gardabani zone, we will see that the Gardabani region is one of the regions of the increased radiation zone Part of the agricultural land in Gardabani district has the highest dose of ^{137}Cs pollution. And from heavy metals the most overdose is fixed to the metal **Zn, Pb, Fe** as for Rustavi and Zestafoni, the level of radiation pollution is not alarming (Table 1, Table 2).

Table. 1. Heavy metal content in soils of district.

Place of sampling	Heavy metal content in soils of district		
	Zn	Pb	Fe
Gardabani	770	360	3492
Rustavi	260	320	3426
Zestafoni	920	280	3105
Makhata Mountain	650	220	2988
MPN	300	130	420

Table.2. Doses of radiation elements in the examined areas.

Regions	Radionuclide Cs -137	Radionuclide Sr-90	MPN Beck/kg Cs -137	MPN Beck/kg Sr-90
Gardabani	47	18,1	50	20
Rustavi	11	27,4	50	20
Zestafoni	31	27	50	20
Makhata Mountain	27	16	50	20

Agricultural production in these areas was carried out on thousands of hectares, of which 3% had ¹³⁷Cs pollution levels above 37 kW / m². Land pollution by ⁹⁰Sr was negligible except for the interior of the Rustavi Metallurgical Plant, so the rest of the areas do not require protective measures. However requires monitoring. Thirty years after the Chernobyl accident, the radiation situation has improved significantly [5].

As a result of the radioactive decay of ¹³⁷Cs, the area of contaminated agricultural land in certain areas was reduced by the contamination density by 33.7%. We have tried to review the radiation situation around the existing enterprises, such as Zestafoni Ferro and Rustavi Metallurgical Plants, to ensure radiation safety, which is reflected in our published works (Fig. 1).

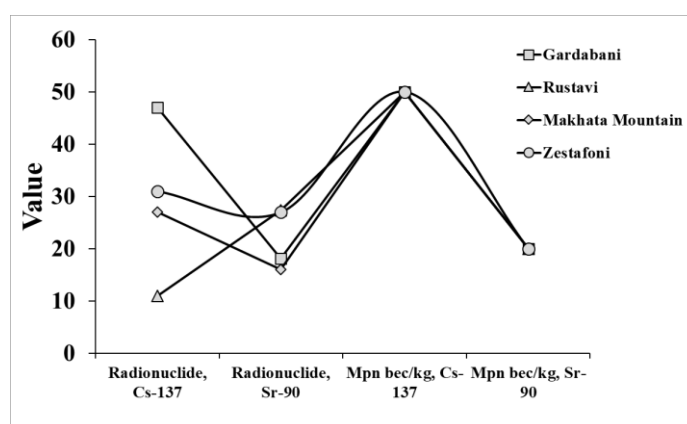


Fig.1. Distribution of Cs -137 and Sr-90 in soil.

Compare in this work with Gardabani, Rustavi and Makhata mountains the radiation factor in terms of its potential threat to life. Has a more balanced character. In terms of both radionuclides and heavy metals. Comparison of these data confirms the absence of harmful consequences of the Fukushima tragedy in Georgia. We will touch on the agrochemical characteristics of the soil in small volumes. Study zone in terms of climate and other conditions. Presented in the above strip loamy, forest brown soils and transitional forms

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რადიონუკლიდების და მძიმე მეტალების გავრცელების შედარება საქართველოს ნიადაგებში

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რეზიუმე

გარემოს დაბინძურება არის ნივთიერებებისა და ენერჯის დაკარგვის არასასურველი პროცესი, რომელიც გამოწვეულია ადამიანის ეკონომიკური საქმიანობით, როგორცაა ნედლეულის მოპოვება და გადამუშავება, რასაც თან ახლავს ბიოსფეროში ნარჩენების გამოყოფა და გაფანტვა. სასოფლო-სამეურნეო ტერიტორიების დაბინძურების გრძელვადიანი საფრთხე (ათწლეულები ან მეტი) დაკავშირებულია ^{90}Sr და ^{137}Cs ხანგრძლივი ბიოლოგიურად აქტიური რადიონუკლიდების ვარდნასთან. ჩვენი კვლევის ბოლო რაუნდის მონაცემებმ აჩვენა, რომ 2013-2018 წლებში ჩვენ მიერ გამოკვლეულმა მიწის ფართობზე შემცირდა ^{137}Cs დაბინძურების სიმკვრივე მახათას მთაზე 3,1%-მდე. გარდაბანში - 5,4%, რუსთავში - 31,9%, ზესტაფონში - 55,4%. ჩვენ გავაგრძელებთ მონიტორინგს და შემოგთავაზებთ შემდეგს კვლევებს ახალ შრომაში.

Сравнение распределения радионуклидов и тяжелых металлов в почвах Грузии

С.Б. Матиашвили, З.Дж. Чанкселиани, Е.В. Мепаридзе

Резюме

Загрязнение окружающей среды - нежелательный процесс потери веществ и энергии, вызванный хозяйственной деятельностью человека, такой как добыча и переработка сырья, который сопровождается разделением и рассеиванием отходов в биосфере. Многолетняя угроза загрязнения сельскохозяйственных угодий (десятилетия и более) связана с падением уровня долгоживущих биологически активных радионуклидов ^{90}Sr и ^{137}Cs . Данные последнего раунда нашего исследования показали, что в 2013-2018 годах на обследованной нами территории плотность загрязнения цезием-137 снизилась до 3,1% на горе Махата, в Гардабани — 5,4 %, в Рустави — 31,9 %, в Зестафони — 55,4 %. Мы продолжим мониторинг и представим результаты в следующей статье.