



Radioactive contamination of the soils of Georgia

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ABSTRACT

After 29–30 years from Chernobyl atomic plant accident the main soil types of Georgia have been examined on contamination presence of ^{137}Cs and ^{90}Sr .

Level of radioactive contamination of soils (^{137}Cs deposition) we can separate three levels: I – 0–10 kgq/m^2 – Black, Cinnamonic, Raw carbonate, Mountain meadow, Chernozems, Black forest brown, Primitive and Yellow soils; II – 10–37 kgq/m^2 – Red, Bog and Yellow forest brown soils; III – > 37 kgq/m^2 – Yellow podzolic soils.

In a big majority of soils ^{137}Cs deposition of layer 0–20 cm does not exceed 37 kgq/m^2 (1 Ci/km^2), that allows us to attribute this examined sample points to non-contaminated territories.

In five points of sampling with maximum ^{137}Cs deposition in a layer of 0–20 cm have been measured specific activities of ^{137}Cs in a layer of 20–40 cm and have been evaluated ^{137}Cs deposition in a layer of 0–40 cm. Results for most of the soils also does not exceed 37 kgq/m^2 (1 Ci/km^2).

Exclusion in Yellow podzolic soil near to v.Jvari (West Georgia), where ^{137}Cs deposition was 38.0 and 70.4 kgq/m^2 accordingly in layers of 0–20 cm and 0–40 cm. We can attribute this zone to radiological contamination, particularly to living zone of privileged socio-economic status. In Yellow podzolic soils we can observe high mobility of ^{137}Cs primary in kaolinite composition of clay fraction and in connection to this lowering of intensity of non-exchangeable absorption by soil of this radionuclide.

In all soils ^{90}Sr deposition in a layer of 0–20 cm does not exceed 11.1 kgq/m^2 (0.3 Ci/km^2) that allows us to attribute examined territories to “relatively satisfying situation”.

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Introduction

From the main types of radioactivity of soils the biggest treat comes from artificial radioactivity. Sources of radioactive contamination of soils are different. This includes global deposition of radionuclides resulting from testing of nuclear weapon, radiation breakdowns/accidents and “peace” nuclear explosions. Radioactive elements are easily accumulating in agricultural products. Radioactive contamination of soils is an independent type of contamination, lowering quality of agricultural production [1].

Exceptionally dangerous in biological relations are anthropogenic radionuclides and in first place ^{90}Sr ($T_{1/2} = 28.79$ years) and ^{137}Cs ($T_{1/2} = 30.17$ years) [2]. Both radionuclides are actively involved in biological circuit of substances as Cs is a chemical analogy of K and Sr of Ca. We must mention that direct proportional

dependency between their content in soil and in plants that grow on it is observed often.

In Georgia after examination of contamination of plants by global deposition of strontium-90 scientist found out, that maximum level of contamination by this radionuclide is in western part of country, on the Black Sea coastal area. In high mountain regions contamination level was not so high.

Like Georgia, also Austria was contaminated after Chernobyl accident [3]. Whereby radionuclides showed very small speed of migration in a few millimetres per year and accumulate in upper parts of soils, transforming them into important source of radioactive elements for plants.

It is also interesting to use ^{137}Cs for evaluation of modern agrogenic transformation of soil layers in Chernobyl contamination region [4]. In addition to the above, ability of using spatial distribution stocks of radioactive isotope ^{137}Cs for assessment of agrogenic transformation of soil layer on territories with high level of Chernobyl contamination. The main basic requirements for the methodology have been examined for particular region. The best

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The Effects of Radiation and Radioisotopes on the Life Processes: Index, 1963 *The Nature of Radioactive Fallout and Its Effects on Man: May 27-29, June 3, 1957. 1008 p* United States. Congress. Joint Committee on Atomic Energy. Special Subcommittee on Radiation, 1957 The Nature of Radioactive Fallout and Its Effects on Man United States. Congress. Joint Committee on Atomic Energy, 1957 *Combined Subject and Author Indexes to Radiobiology Bibliographies* U.S. Atomic Energy Commission. Division of Technical Information, 1967 **The Nature of Radioactive Fallout and Its Effects on Man** United States. Congress. Joint Committee on Atomic Energy. Special Subcommittee on Radiation, 1957 Public Health Service Publication, 1967 **Environmental Protection Research Catalog: Indexes** Smithsonian Science Information Exchange, 1972 **Soviet Soil Science**, 1968 **U.S. Environmental Protection Agency Library System Book Catalog** United States. Environmental Protection Agency. Library Systems Branch, 1975 *KWIC Index to the Journal of the Health Physics Society*, 1958 *Scientific Basis for Soil Protection in the European Community* H. Barth, P. L'Hermite, 2012-12-06 PH BOURDEAU Directorate General Science Research and Development Commission of the European Communities Brussels Belgium We are living on a unique planet the only one in the solar system where life exists The very existence of life has modified the physical and chemical environment of the earth its atmosphere and oceans in a way that makes life sustainable This system with its complex cybernetic mechanisms has been named GAIA by Lovelock Man has always interfered with it on a more or less limited scale This interference is now reaching global proportions such as climate modifications resulting from CO and trace gas 2 accumulation in the atmosphere or the destruction of stratospheric ozone not to speak of global radioactive contamination GAIA will probably prevail as a living system but it probably does not give much importance to man s survival as such and it is man that has to take care of his own survival In the ecosystem of Planet Earth soils are the thin interface between lithosphere and atmosphere which constitutes the essential substrate for the terrestrial biosphere the productivity of which far exceeds that of the oceans even though the latter cover a much larger area than the continents Soils themselves are complex systems They develop through weathering of minerals are colonised by living organisms which in turn modify their substrate making it suitable for other organisms This induces a primary ecological succession which eventually reaches a climax in equilibrium between climate soil and the biological communities
Bibliography of Agriculture, 1976 **Hearings and Reports on Atomic Energy** United States. Congress. Joint Committee on Atomic Energy, 1957 **Radioecology and the Restoration of Radioactive-Contaminated Sites** F.F. Luykx, Martin J. Frissel, 2012-12-06 Most of the nuclear facilities built since the Second World War have ceased active operation and have been decommissioned Some of the sites are heavily contaminated with radioactive substances Correct and efficient action to mitigate the radiological consequences of such contamination will only be possible when the behaviour

of radionuclides in the terrestrial environment is sufficiently well known Yet radioecologists often find it difficult to study the transfer of radioactivity in agricultural land and semi natural ecosystems because of the complexity and diversity of such environments The present book presents an analysis of all the factors that affect the behaviour of radionuclides as they move from their point of release through the environment and then enter the tissues of biota living in the ecosystems in particular plants and animals consumed by humans The course on which the book is based was held in a region that is heavily contaminated by radioactive discharges into the environment during nuclear weapons fabrication in the 1950s and 60s and due to a severe accidental release following the explosion of a rad waste tank in 1957 This allowed in situ training of the students The book s main emphasis is on specific radioecological problems in severely contaminated areas in the former Soviet Union the Southern Urals Trail the rivers Techa Isert Tobol Irtis Ob and the 30 km zone around Chernobyl Systems examined include soils arable and pasture land forests lakes and rivers Special attention is paid to the effects of radiation on natural ecosystems trees soil dwelling organisms and aquatic organisms Synergistic effects are also considered Short medium and long term countermeasures are discussed *Toxicology Research Projects Directory* ,1980-04 *Bibliography of Agriculture with Subject Index* ,1985 **Bibliography of Agriculture** ,1977 Vols for 1975 have data provided by National Agricultural Library U S Department of Agriculture *Green Chemistry in Practice* Thomas McKeag,2023-04-01 *Green Chemistry in Practice Greener Material and Chemical Innovation Through Collaboration* collects a unique set of case studies based on researchers experiences in developing practical green chemistry driven solutions to industry problems as part of the Greener Solutions Program at the Berkeley Center for Green Chemistry Beginning with an introduction to green chemistry the book goes on to provide an overview of the interdisciplinary approach taken by the Center which aims to bring about a generational transformation toward the design and use of inherently safer chemicals and materials through research teaching and outreach This is followed by four detailed case studies revealing each step of the process involved in assessing and designing greener solutions to real world problems in the fields of preservatives textiles additive manufacturing and green energy Drawing together the hands on practical experience of an interdisciplinary team from across academia and industry Practice in Green Chemistry provides a unique insight into the practicalities of applying green chemistry principles in support of a global push toward a more sustainable world *Green Chemistry in Practice Greener Material and Chemical Innovation Through Collaboration* is also a valuable resource for both academia and industry students and researchers Reviews the foundational principles of green chemistry in the context of real world scenarios Highlights successes pitfalls and practical steps to take when working with a multifaceted interdisciplinary group Supports those involved in designing and implementing green solutions across a whole range of fields *Nuclear Science Abstracts* ,1976

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