Im Allgemeinen zeigt die Feuchtigkeit eine positive und die Temperatur eine negative Korrelation mit der elektromagnetischen Emission.

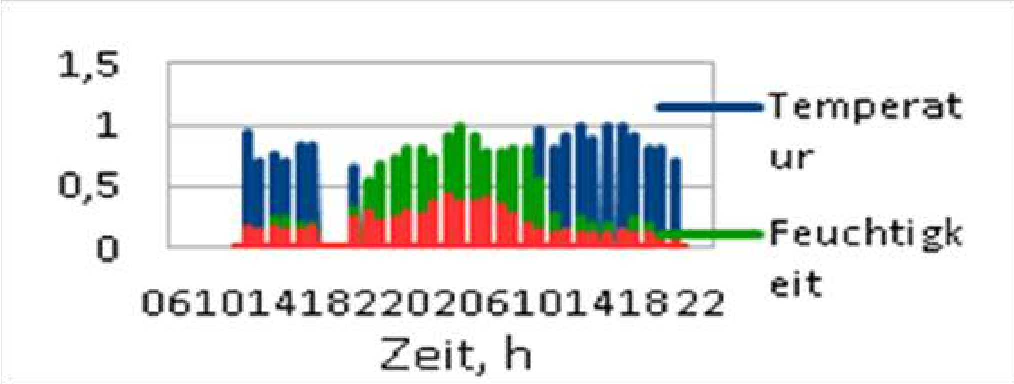

Abb. 4.Korrelation zwischen der Wetterbedingungen und dem Parameter A für die Tage 28.07.16 und 29.07.16

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ORGANIZATION OF RADIOECOLOGICAL RESEARCH AT EARLY STAGE OF FIELD DEVELOPMENT IN ELKON URANIUM ORE DISTRICT (SOUTH YAKUTIA)

I.V. Pavlova, S.A. Kurilo
Scientific advisor associate professor V.A. Domarenko
Tomsk Polytechnic University, Tomsk, Russia

The considered area is generally classified as rather complex from geological, geotechnical, mining, technical, environmental, and other points of view that determine the expediency of its mining development and a number of factors that must be taken into account at all stages of the planned works.

The specific natural and technical system forms in the process of construction and operation of the designed facility. The natural and technical (engineering) facilities are in complex and changing in time and space relations within such a system.

It is necessary to organize local environmental monitoring to adjust environmental measures timely and to control the man-caused load and the state of natural objects. The need to develop a monitoring system is determined by the Decree of the Government the Russian Federation # 177 dated 31 March 2003 “On the organization and implementation of state monitoring of the environment (the state environmental monitoring)” where the state environmental monitoring is a comprehensive system of environment monitoring, environmental change assessment and prediction under the influence of natural and anthropogenic factors (hereinafter referred to as environmental monitoring).

The scope of environmental monitoring operation are the boundaries established by the project (zones) of the planned facility impact on the environment components and population living conditions.

Local environmental monitoring at the planned facilities (a dump, tailings pond, etc.) should be an integral part of the ecological monitoring system of Elkon Mining and Metallurgical Plant.

Radiological studies show that in the area of the Elkon uranium ore district since the beginning of the 1990s and up to now there is a tense radioecological situation in certain technological areas. Some of radioactive dumps of rocks stockpiled at the surface are particularly dangerous sources of radionuclide contamination of the main components of the mountain taiga ecosystems as a result of wind and water dispersion, as well as the emanation (radon exhalation). The result is that in the process of long-term (30-40 years) man-made pollution of ecosystems the natural radionuclides, in particular uranium, have been accumulated. Some components of taiga-permafrost landscapes exceed or approach the standards established for radioactive wastes (the Radiation Safety Standards (NRB-99) in the level of activity. Accordingto the research results, such components may include some kinds of mosses, hydromorphic soils, and bottom sediments. The radionuclides migrate at long distances, and the man-made radioactive polluted sites occupy large areas. All this proves the need to organize comprehensive long-term environmental monitoring in the area.

The initial phase should be carrying out gamma and gamma-ray spectral and emanation express survey with special tools of radiometric equipment. Since the dump shape and size are different, it is impossible to carry out the survey according to a well-defined network of man-made areas. One may use radial and square survey grids or arbitrary surveying points. In any case, the density of the survey grid should provide a representative assessment of the main measured radiation parameters of radioactive rocks in dumps (exposure dose, the concentration of natural radioactive elements, radon flux density). It should be noted that the scintillation hiking radiometers such as SRP-68-01 do not allow assessing the contamination border precisely in the area of wind scattering. Thus, high concentration of radionuclides is found in the wind rose at a distance of 600-1000 m from the source of contamination at the level of gamma background 7-12 mcR/h at the top of the soil profile. This means that the real boundaries of wind dispersion of radionuclides from pollution sources can only be detected directly by their content in soil.

The research experience also shows that soil samples should be selected according to horizons (leaf fall, leaf-litter, grass sod, humus, accumulative, and mineral horizon in the direction of wind dispersion of radionuclides in 50-250 m before the exit of fixed pollution on the background level. One should also select vegetable samples (moss, lichen, higher plants) apart from soil samples in the researched area. When sampling of trees and shrubs, one should separate them into components: needles (leaves), branches, bark, and wood.

Special approaches should be implemented in the study of the aqueous dispersion of radionuclides from dumps. Our research experience shows that the water dispersion of radionuclides is well detected by gamma survey at considerable distances along the flow stream vector from pollution sources. The radioactive equilibrium between uranium and radium is violated in the sediment and silt soil typically with the uranium quantity excess. Therefore, the assesment of uranium concentration through radium by both field and laboratory gamma-ray spectral methods are not entirely correct. In this case, it is better to determine the uranium concentration in samples in a laboratory by other methods, for example the X-ray wavelength method. Hydromorphic (alluvial and boggy) soils, bottom sediments, and plants (hydrophilic mosses and grasses) are the most informative objects of radioactive contamination in the aqueous dispersion zone. Sampling should be carried out in 100-350 m before pollution reaches on the background level.

Specific requirements for conducting radiation monitoring in the researched area should be applied to assess the background concentrations of natural radionuclides in the main components of mountain taiga landscapes (surface water, bottom sediments, soil, plants, and non-wood forest resources). The radiation situation here is initially unhomogeneous due to the geological features of the Elkon uranium ore district (the Elkon horst). The numerous rock exposures with high natural background radiation are registered in the researched area. The concentration of radionuclides in the main landscape components should be increased in comparison with their bulk earth content in the exposures of these rocks. This should necessarily be taken into account for radioecological monitoring.

The results of radioecological research show that an intensive uncontrolled process of radionuclide (^{238}U, ^{235}U, ^{226}Ra, ^{222}Rn and ^{210}Pb) dispersion takes currently place in the areas of radioactive rock storage from dumps as a result of emanation and water and wind transport. Therefore, the long-term comprehensive radioecological monitoring of the studied taiga-permafrost landscapes in a complex with other environmental measures planned for the Elkon horst, especially at the beginning of the industrial development, is necessary. In this respect, in our opinion, water dispersion of uranium and other radionuclides from dumps should be always controlled and estimated according to the seasons (winter, spring, summer, and autumn) at different flow patterns (flood flow and low flow) of rivers and streams. In addition, it is necessary to determine the level of background radiation and radon flux density and evaluate wind transfer of radionuclides at different distances from pollution sources. The surveying points should be fixed with GPS. All the main landscape components should be the objects of complex radioecological monitoring if possible. One periodically needs to monitor the level of radionuclide pollution of local food products and non-wood forest resources (mushrooms, berries, meat of game birds and wild animals) in the zone of dump impact.

Three forms of radionuclide dispersion should be distinguished for radionuclide migration in the technological areas of the Elkon uranium ore district: 1) wind (aeolian); 2) water (hydrogenic); 3) mechanical (anthropogenic). The significance of the last form of radionuclide dispersion increases especially at the beginning of industrial development of these fields, when the intense movement of technological vehicles transporting ore mass is expected and drilling-and-blasting is carried out.

Proposals to organize monitoring to estimate the environment quality:

It is desirable to assess the environment quality according to the organism development stability violation within the frames of the program of comprehensive environmental monitoring. This technique is recommended to assess the anthropogenic impact on land ecosystems by the Ministry of Natural Resources of the Russian Federation (Order # 460-r dated 16.10.2003).

The advantages of this technique:

- it quite simple to collect and process the material;
- it does not require expensive equipment;
- it reflects the general level of the environment quality formed by a number of negative factors of a different nature;

- it is widely used in Russia, so the results can be compared with other regions.
- Proposals to organize monitoring:
- It is necessary to equip several stationary surveying points in area of mining and metallurgical plant construction, in areas of long-term anthropogenic impact, and in virgin territories;
- Samples should be collected annually in mid to late summer, when lamina has been completely formed;
- One should use several model species to obtain the objective results, for example flat-leaf and divaricate birch, shrub alder, and small mammals;
- One should carry out the studies using the ecogeochemical data and accurate dosimetry of surveying points;

The research on phytotoxicity of soil and plant seed productivity should be added to the bioindication of land ecosystems.

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ABBILDUNGSPROZESSEN IN ERDÖL-WASSER-EMULSIONEN

K.A. Polyakova

Wissenschaftliche Betreurinnen Dozentin E.A. Kuzmenko, Dozentin S.W. Kogut

Nationale Wissenschaftliche Tomsker Polytechnische Universität, Tomsk, Russland

Aus dem Bohrloch kommen zusammen mit dem Erdöl Wasser, Begleitgas, Feststoffpartikeln.

Schichtwasser ist ein stark mineralisiertes Medium mit dem Salzgehalt von bis zu 300 Gramm pro Liter. Das Gehalt von Schichtwasser in Erdöl erreicht bis zu 80%. Mineralwasser ruft Rohrleitung- und Ölbehälterkorrosion. Die Feststoffe, die mit dem Erdölfluss aus dem Bohrloch kommen, verursachen den Verschleiß von Rohrleitungen und Anlagen.

Emulsionen sind Systeme, die aus zwei oder mehr nicht mischbaren flüssigen Phasen bestehen. Dabei liegt eine Phase als Tropfenphase verteilt vor. Sie wird als disperse Phase bezeichnet. Die Phase, welche die disperse Phase umgibt, bildet die kontinuierliche Phase [1].

Alle Öl-Emulsion werden in drei Gruppen eingeteilt:

Gruppe 1 - inverse Emulsion (Wasser in Öl), der Gehalt davon in der dispergierten Phase (Wasser) in einem Dispersionsmedium (Öl) kann von Spuren bis 90-95% liegen. Gruppe 2 - ist eine direkte Typ-Emulsion (Öl in Wasser). Sie werden in dem Prozess der Zerstörung von inversen Emulsionen gebildet, d.h. wenn Öl Emulsionsspaltung. Gruppe 3 - eine „multiple“ Emulsion.

Die Stabilität von Emulsionen ist von vielen Faktoren abhängig, dabei insbesondere von:

- der Tröpfchengröße und der Tröpfchengrößenverteilung,
- den Dichteunterschieden zwischen zwei Phasen einer Emulsion,
- der Viskosität der kohärenten Phase,
- der Grenzflächenspannung zwischen den Phasen sowie
- der An- bzw. Abwesenheit eines Tensids.

Wenn die Menge an Schwebeteilchen größer 0,5 mkm Sedimentationsrate von Wassertröpfchen oder Heberecht Ölteilchen in Wasser unterliegt Stokes ,, wonach, je kleiner die dispergierten Teilchen, die Differenz zwischen den Dichten von Wasser und Öl und je größer die Viskosität des Mediums erfolgt die langsamere der Prozess der Trennung:

$$w = \frac{d^2(\rho_в - \rho_н)}{18\eta} g$$

wobei w - Tröpfchensenkungsgeschwindigkeit in cm / sec;