STUDING RADIOECOLOGICAL PROBLEMS IN THE CASPIAN REGION

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Abstract

In the present article there is given analysis of materials about study of the natural and anthropogenic radio nuclides in the Caspian region for the creation of a monitoring network and the assessment of radiological hazards with determinations of compliance to international health and safety standards. Radionuclides are come across in different districts of the Caspian territory and their radiation give way to the realization of the ionizing radiation. Also there have been shown ways of nature protection on the ecological and legal base to prevent water pollution. In the Caspian districts where more than 3 million people live, the investigations carried out about the radiation levels do not draw a clear picture about the environmental pollution.

Keywords: Caspian region, radiation radio – spectrometric analysis, radionuclide

PROPOSAL: To study the natural and anthropogenic radio nuclides in the Caspian region for the creation of a monitoring network and the assessment of radiological hazards with determinations of compliance to international health and safety standards.

OBJECTIVES: Determination and monitoring of radiation levels in water, air soil, food products, and biota.

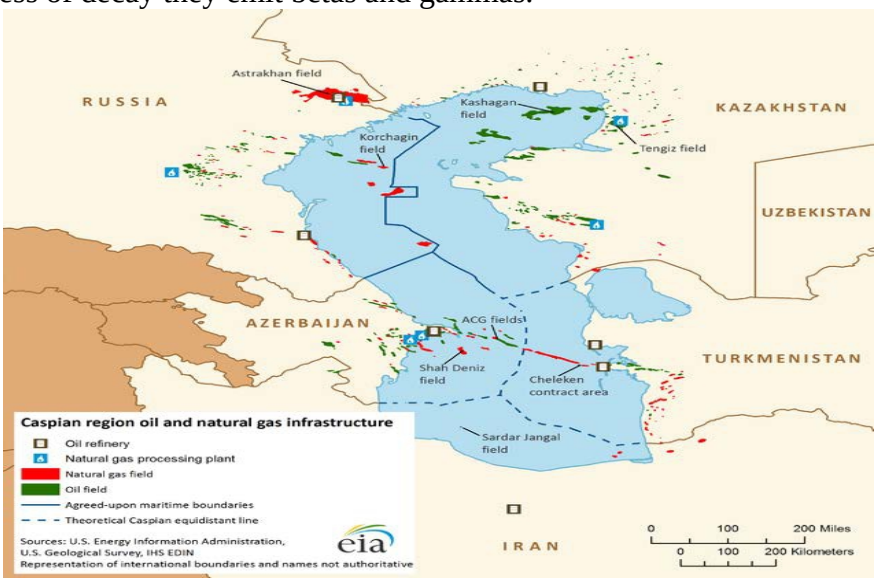
Introduction

It is a fact that the ever-growing development of the petrochemical industries dominates other industries in importance and growth in the Caspian Region. Subsequently, throughout the 20^{th} century and into the new millennium, the petrochemical industries have been responsible for the greatest environmental impact throughout the Caspian region.

Radio-isotopes (radio nuclides), derived from stable isotopes, have ionizing radiation penetrating into all living organisms, that can result in undesirable anomalies and even in lethal outcome.

A consequence of this growth and continued activity is the increase of background radiation in the region. For example the process of drilling for oil releases naturally occurring radionuclides from deep in the earth and bring them to the surface in concentrations not usually seen in the environment. The drilling itself does not produce radioactive elements, but can concentrate these naturally produced radioactive elements in such a fashion that they are hazardous to the environment, workers, and the general population. The hazards of these radioisotopes are well documented.

Natural radioactivity (NR), in other words background radiation, is basically the consequence of naturally occurring radiation that is tolerated by living organisms and it reaches 10 mR/h in different regions of the Caspian territory. Uranium-238, Radium-226, actinium-thorium-232 of which uranium and thorium are the most abundant ones are the major sources of natural radiation. They undergo spontaneous decay, forming different sets of radio-elements and isotopes with various half-life periods (HLP). Radon is a unique natural element. It is a noble gas, and radioactive in all of its isotopes. Radon isotopes are born by the decay of radium and they exist in soil and underground water sources. Radioisotopes such as Rubidium-87 and Indium-115 emit insignificant amount of natural radiation and they are comparatively rarely found. NR basically depends on the contents in the substratum of uranium, thorium, radium and carbon that are regarded as long-life isotopes with long HLP (in the order of 104–1010 years). In the process of decay they emit betas and gammas.



Many reasons could cause artificial radioactivity (AR): they include nuclear or thermonuclear reactions, nuclear wastes and accidents in nuclear power plants (NPP) as in the case of Chernobyl. Following a nuclear reaction radio elements and isotopes such as Sr-90, Cs-137, Ce-144 are formed, which are not among the NR elements, and their HLP may range from a fraction of a second to many years. Radioactive clouds that formed in the atmosphere as a result of a nuclear explosion penetrate into the troposphere, and moreover ultra fine particles and gases reach up to the stratosphere causing global pollution. Elements causing AR fall out from the atmosphere, dissolve in water and eventually penetrate the upper 3 to 5 cm layer of soil and slowly migrate through the soil structure.

Radionuclides are come across in different districts of the Caspian territory and their radiation give way to the realization of the ionizing radiation.

In the Caspian districts where more than 3 million people live, the investigations carried out about the radiation levels do not draw a clear picture about the environmental pollution.

In an oil field, oil itself may not be the greatest treat in terms of radionuclides. During oil production activities, another substance extracted together with crude oil is water. Water associated with crude oil is either due to connate water or aquifer water or both. That water contains more radionuclides such as Radium-226 and Radium-228 compared to the crude oil (Gadjiev B.A., et.al. Oil of Azerbaijan. Book, Baku, 1988). On the other hand, all stages involving oil production and handling activities such as storage tanks, pipelines, containers could potentially pose an environmental hazard concerning radioactivity.

Furthermore, Azerbaijan has iodine plants, where coal, with radioactive contents, being used in Surakhani district hence nearby districts – Amirjan and et - are contaminated by the radioisotopes. The level of radiation ranges from 300 up to 2000 mR/h in the plant itself.

The above reasons cause alarming interest on the specialist to carefully investigate the detection of legitimacy regarding the migration and localization of radio isotopes that relate to environmental impacts on living organisms.

The pollution of the Caspian districts is not limited only by radioactive radium. It is known that products of oil, petrochemical and chemical industries are associated with radioactive radon, uranium, thorium, iodine and many other isotopes of radio elements. For example, modern iodine-brome industry is the major source of radioactive I-129 isotope around the Caspian districts – Sumgayit and et. Next is the chemical industry in the city of Sumgait, which is located not far from the Caspian Sea, that releases at the least C-14 isotope which should also be subject to research.

Oil polluted soil in petroliferous regions located in the Caspian territory draws a rather different picture regarding universal radioactive pollutants. For example, radium and thorium contents in the uppermost layer of soil exceed the Clarke's Standards 2.5 and 1.2 times respectively. According to the Clarke's Standards Radium, Thorium and Uranium contents in the uppermost layer of soil should not exceed 5.20x10-4, 6.98x10-4 and 1.95x10-4 % respectively.

Undesirable conditions created by different sources in the Caspian territory, in fact, urge the necessity to organize a monitoring service for the determination of the basic radio nuclides in the environment. This monitoring network will provide indispensable data about the Caspian territory thus helping environmental control over the pollutants to decrease the radioactivity to the best measures preserving the genetic structure in the region in the long term.

Experiment

In our investigation we will measure radiation levels in water, air soil, food products, and biota around the Caspian region using a thermo-luminescent dosimeter device such as DTY-01. Measurements carried out so far showed that radiation level values fluctuated within the range of ±30% around the average value.

Discussions

Radiological problems of the Caspian See are constantly on the agenda as an actual problem. They have been repeatedly discussed in various platforms and scientific meetings. We constantly examine the methodology and results of scientific studies carried out on the subject in various aspects

There have been shown sources of pollution of the Caspian Sea environment. These sources endanger ecological safety of the Caspian Sea. There has been offered the regime of sea safeguarding made on the base of ecological risk which was established both by world experience of the fight with oil pollution and by the principles of ecological and legal rationing maximal concentrations of pollutants. There has been made analysis of ecological danger that has much in common with ecological disaster during oil production in the Caspian Sea and its consequences for environmental safety of the Sea. The environmental safety of the Caspian Sea was stipulated by fluctuations of its level that leads to the flooding deserted oil fields in the eastern shores of the Caspian Sea on the territory of Republic of Kazakhstan..

Conclusion

The necessity of the petrochemical industries is the most important aspect of economic developement in the Caspian region. This development must occur with due regard to the assessment of the radiological impact to accepted international standards.

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