STUDY ON ENVIRONMENTAL RADIOACTIVITY LEVEL IN CRAIOVA CITY

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Abstract
Knowledge of environmental radioactivity represents both the city of Craiova, and for Oltenia area a priority, due to the standard program of special surveillance of the area of influence CN Kozloduy. In this context were made in 2008-2009 a series of measurements on environmental radiation protection, the detection, warning and alarm of decision facts in the case of events with radiological impact on the environment and human health.
During 2008 we have determined a number of indicators with AMP-07 analyzer, like: specific global beta radiation, spectrometric gamma radiation, Be-7 and Pb-210 concentrations. These parameters were determined from: atmospheric aerosols, total atmospheric deposition and from rainfall, drinking water, soil and vegetation in the area of Craiova city. From measurements is observed correlations between climatic conditions (precipitation, temperature) and the amount of radiation. Values determined are under the minimum detectable activity and refers both to the cumulative effect of radiation emitted by Kozloduy CN and the ash and slag from TPP I and TPP II Craiova.

Keywords: radioactivity, global beta, gamma radiation, aerosols, radioisotopes

1. INTRODUCTION

In Dolj County there are two radiation monitoring stations, namely in the city of Craiova and Bechet town, they being in the zone of influence of the CN Kozloduy.
In 2008, radioactivity surveillance program aimed the estimation based on the measurements of the radiation environments exposure (air, water, soil).
We are constantly exposed to low levels of radiation from both natural, or background, these representing more than 80% of exposure to ionizing radiation [3].
There are three types of ionizing radiation: alpha, beta and gamma [1]. Further we studied the beta and gamma radiations. Beta radiations are a type of radiation that are emitted from β particles. They affect health only when they are ingested with a number of foods [2]. Gamma radiations have a much shorter wavelength than UV radiation and therefore penetrate deeper into the matter. Measuring the amount of radiations we can detect sources of radiation and we can take measures to avoid their effects [4].

2. MATERIALS AND METHODS

To determine the environmental quality were monitored using portable multichannel analyzer AMP-07: atmospheric aerosols, total atmospheric deposition and from precipitation, drinking water, soil. The data were compared with standards.

Figure 1. Portable multichannel analyzer AMP-07

This is a modern device consisting of a smart transducer beta and gamma radiation and a portable PDA computer. High sensitivity transducer is recommended to search activities, rapid location and identification of sources of radiation or radioactive-contaminated areas.
The device can function both as spectrometer and gamma radiation debit meter.

3. RESULTS AND DISCUSSION

3. 1. Climatic conditions

Global assessment of climate conditions in the city of Craiova, namely rainfall and

temperature are key factors in determining the environmental radioactivity levels (Figure 2,3).
Large amount of precipitation carry global beta and gamma radiation and some radionuclides such as Be-7 and Pb-210.
These radiations are determined after the water derived from precipitation was evaporated to dryness.
High temperatures affect soil radioactivity by increasing the evaporation process.
At vegetation occurs the evapotranspiration, also with impact on the phenomenon of radioactivity.

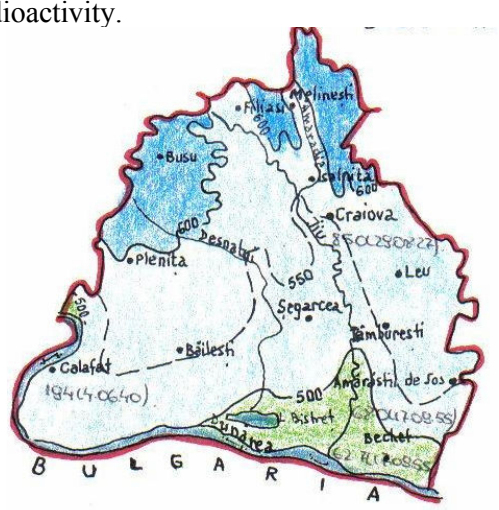

Figure 2. Atmospheric precipitation – average values - 2007-2008

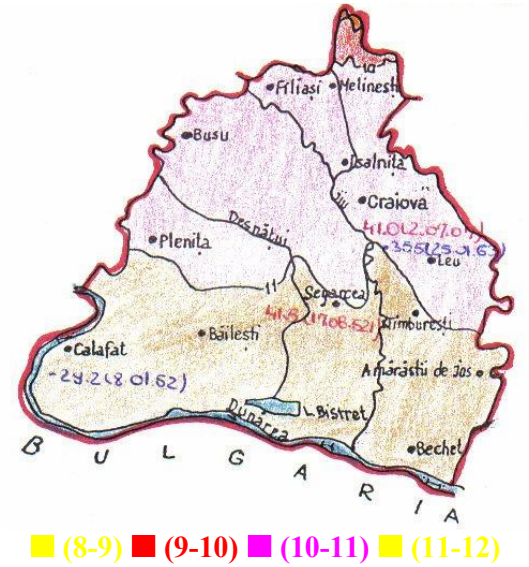

Figure 3. Air temperature (^{0}C) – average values - 2007-2008

3. 2. Air radioactivity

In Craiova city, total atmospheric deposition and rainfall situation, global beta Bq/m2/day specific activities, are presented in Figure 4.
Higher values were observed in May and August.

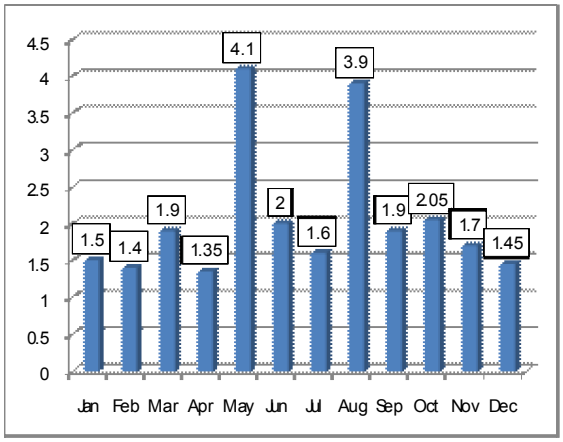

Figure 4. Global beta radiation content of atmospheric deposition

Most concentrations were below minimum detectable activity.
The concentration of radioactive gases descendents was determined in samples of deposits by gamma spectrometric measurements. Higher values were observed in January, March and October (Figure 5).

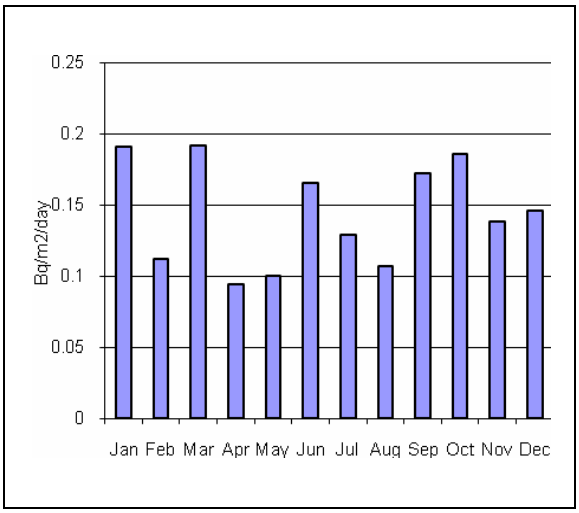

Figure 5. The concentration of atmospheric aerosols in gamma radiation

Be-7 concentration varied between 0.27 and 3.64 Bq/m2/day, this activity being under the maximum permissible concentration.
Higher values were observed in March, September and October (Figure 6).

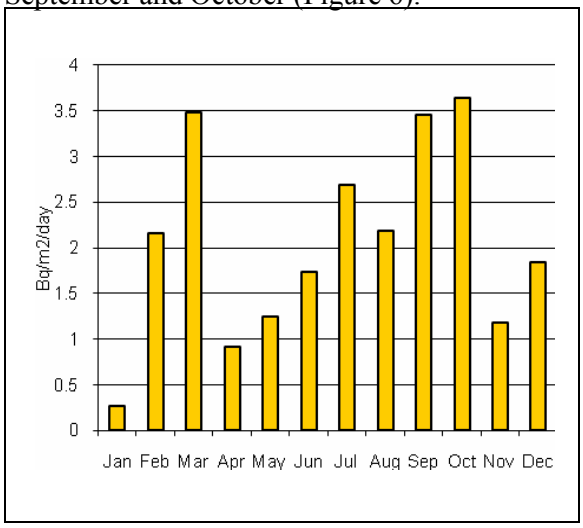

Figure 6. Be-7 concentration in atmospheric deposition and precipitation

Pb-210 concentration has values between 0.039 and 0.076 Bq/m2/day. Higher values were observed in June and September (Figure 7).

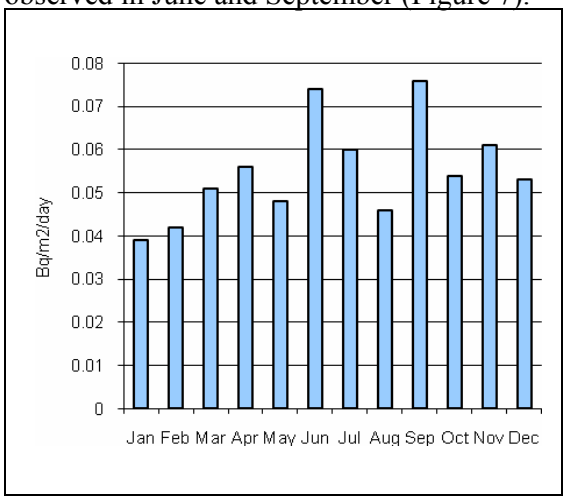

Figure 7. Pb-210 concentration in atmospheric deposition and precipitation

3. 3. Water radioactivity

Spectrophotometric gamma radiation was determined from Jiu water, the average values are presented graphically.

Thus, samples were collected sample of 2 l and brought to dryness, and from the sediment was determined spectrophotometric gamma radiation.
We haven't observed large variations of values, which show a nearly constant radioactivity, over the entire period of research.
We noticed higher values in May and September (Figure 8).

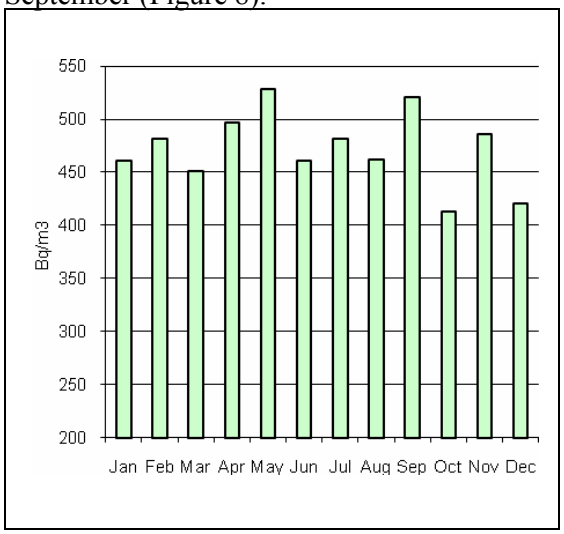

Figure 8. Spectrophotometric gamma radiation in Jiu water

3. 4. Soil radioactivity

Soil radioactivity is due to existing rocks at different depths, which emit beta radiation overall. In the spring and summer there is a larger amount of global beta radiation in soil of Craiova city (Figure 9).

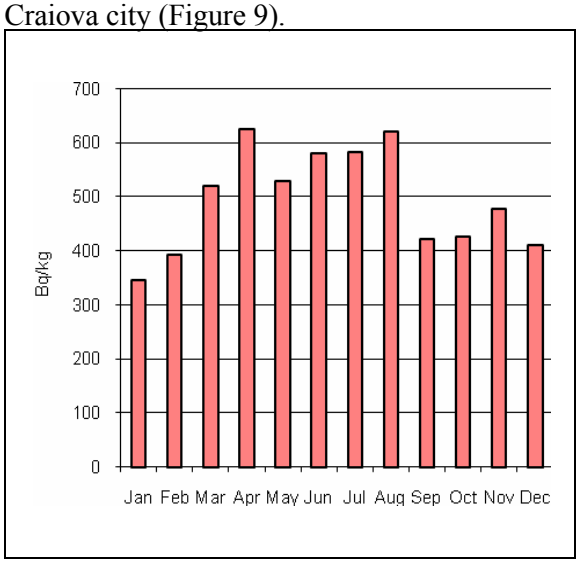

Figure 9. Global beta radiation content of the soil

3. 5. Vegetation radioactivity

As can be seen in Figure 10, the largest amount of global beta radiation (Bq/kg) was recorded in July, August, September, values varying between 169.3 and 198.5 Bq/kg.

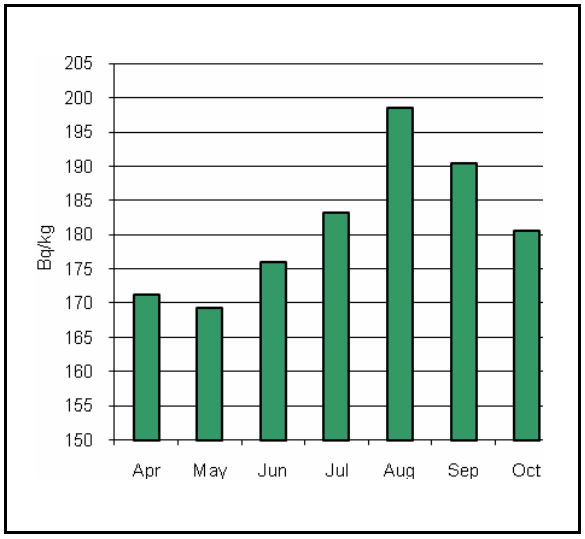

Figure 10. Global beta radiation content of the vegetation

The natural growth of environmental radioactivity in Craiova city is largely due to the ashes dump from two power plants and Doljchim Craiova.
Although investigations have not been conducted on ashes dump above mentioned, this was not our object of study in this paper, their influences were found in the environment.
It is noted that radiation may originate from the Kozloduy Nuclear Power Plant.
Analyzing information on radioactivity may be a causal link between the impact of Chernobyl Nuclear Power Plant (1986) and increased radiation in the environment since our day.

4. CONCLUSIONS

Following the determinations made were not recorded values over the maxim admissible concentration.
Were monitored:
- in air: aerosols, global beta and gamma radiation, atmospheric deposition and water from precipitation, radionuclides Be-7 and Pb-210.
- in Jiu water: spectrophotometric gamma radiation;
- in soil: global beta radiation;
- in the vegetation: the global beta radiation.

We noted a relationship between temperature, precipitation and the environmental radioactivity. Radiations have significant values during periods of rainfall and high temperature.
We noted the cumulative effect of ashes dump near Craiova, nuclear power plant of Kozloduy and the residual effects of the accident from Chernobyl.

5. REFERENCES

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