

RADIOACTIVITY IN THE SEDIMENTS OF CENTRAL ADRIATIC

RADIOAKTIVNOST U SEDIMENTIMA SREDNJEG JADRA

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Gamma-spectrometric measurement of samples were made with 1.95 KeV resolution and 25% efficiency HPG detector at 1.33 MeV, connected to the 4096-channel analyser and computer. Analysis of results shows that content of the natural radionuclides of the uranium and thorium families is approximately the same in all of the six tested locations.

The most dominant among natural radionuclides is K-40. The highest value for K-40 (613.5 Bq/kg) was found at the location 16 and lowest (71.40 Bq/kg) at the location 20A.

Fission radionuclides Cs-137 and Cs-134 were found in all of the tested sediments samples. Their content ranges from 0.27 to 6.07 Bq/kg for Cs-137, and from 1.63 to 2.92 Bq/kg for Cs-134.

INTRODUCTION

Sediments play a dominant role in the aquatic radioecology and serve as a storage for radionuclides. Through organisms feeding on these sediments, radionuclides transferred to the higher trophic food chains. The radionuclide content in the sediments is particularly important for the sea organisms living and feeding on the sea bottom (Eisenbud M., 1973).

Sediments have the highest level of radionuclide activity in the marine ecosystems. The concentration of radionuclides in sediments varies with depth, characteristics of the sediment, vicinity of the coast, etc. (Harvey B.R. and P. J. Kershaw, 1984).

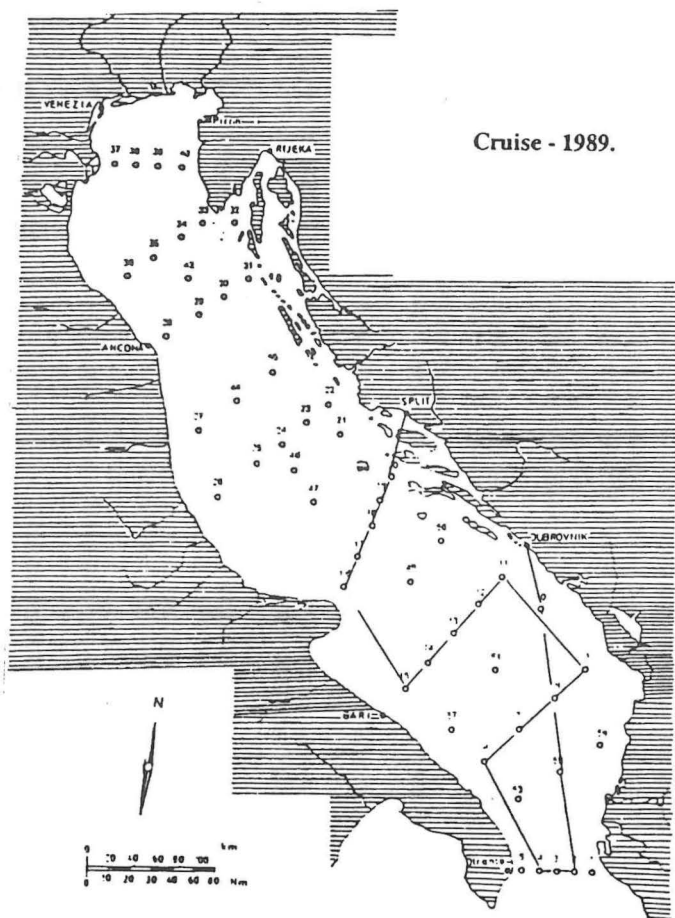


Fig. 1. "Andrija Mohorovičić" 1989 cruise

Sediments samples were taken by a scoop from the research ship "Andrija Mohorovičić" in the summer of 1989. Sediments were taken at six stations (20A, 20, 17, 16, 15, 11) in the quantity of 3 - 5 kg. Gamma-spectrometric measurement of samples were made with 1.95 KeV resolution and 25% efficiency HPG detector at 1.33 MeV, connected to the 4096-channel analyzer and computer (K l j a j i ć ,R. *et al.*, 1989.).

RESULTS AND DISCUSSION

The results are presented in Tables 1. and 2. Analysis of results shows that content of the natural radionuclides of the uranium and thorium families is approximately the same at all of the six tested locations. There follows a logical conclusion that natural radionuclides are in equilibrium with ambient sea water and that variations are due to the different geological composition of sediments.

Table 1. Level of radionuclide activity in the sediments of the Adriatic sea (Bq kg⁻¹)

Radionuclide	Station 20A	Station 20	Station 17
U-238	10.44+ -5.63	<33.13	33.53+ -14.48
Ra-226	8.94+ -3.32	9.16+ -4.05	21.15+ -4.41
Th-232	9.77+ -4.10	15.14+ -4.63	32.55+ -5.80
K-40	71.40+ -17.26	216.95+ -25.51	484.21+ -36.94
Cs-137	<6.76	0.27+ -0.13	1.64+ -0.72
Cs-134	<3.96	<4.40	4.31+ -1.78

Table 2. Level of radionuclide activity in the sediments of the Adriatic sea (Bq kg⁻¹)

Radionuclide	Station 16	Station 15	Station 11
U-238	23.83+ -16.03	40.79+ -16.05	18.20+ -15.16
Ra-226	18.88+ -4.44	29.57+ -5.72	38.74+ -8.25
Th-232	39.01+ -8.05	31.37+ -6.23	10.17+ -4.96
K-40	613.50+ -12.52	486.12+ -40.60	539.49+ -41.58
Cs-137	6.07+ -2.98	2.09+ -1.84	<9.06
Cs-134	2.92+ -1.10	1.63+ -0.51	<5.31

The most dominant among natural radionuclides is K-40. The highest value for K-40 (613.5 Bq/kg) was found at the location 16 and lowest (71.40 Bq/kg) at the location 20A. Fission radionuclides Cs-137 and Cs-134 were found in all of the tested sediment samples. Their content ranges from 0.27 to 6.07 Bq/kg for Cs-137, and from 1.63 to 2.92 Bq/kg for Cs-134.

CONCLUSION

1. The content of natural radionuclides of the U and Th families in the sediments of central part of the Adriatic is rather uniform, while K-40 exhibits significant variations caused by the different geological composition of sea bottom and the origin of sediment.

2. The presence of the fission radionuclides, Cs-137 and particularly Cs-134, indicate that there has been an additional radiocontamination of the Adriatic, probably caused by the Chernobyl accident.

REFERENCES

- Eisenbud, M. 1973. Environmental radioactivity. Academic press New York and London.
- Harvey, B.R. and P.J. Kershaw. 1984. Physico-chemical interactions of long lived radionuclides in coastal marine sediments and some comparisons with deep sea environment. Report EUR 9214 En.
- Kljajić, R., E. Horšić, L. Jerković and D. Samek. 1989. Radioaktivnost mulja u zalivu Klek Neum prije i poslije havarije u Černobilju. Proceedings of the Symposium "Zaštita voda '89" Vol 2, 220-222.

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KRATKI SADRŽAJ

Sediment igra dominantnu ulogu u akvatičnoj radioekologiji i služi kao skladište za radionuklide. Preko organizama koji se hrane sedimentu radionuklidi se prenose u više trofičke nivoe. Sadržaj radionuklida u sedimentu je posebno važan za one morske

organizme koji žive i hrane se na morskom dnu. U ekosistemu mora sediment ima najviši nivo aktivnosti radionuklida. Koncentracija radionuklida u sedimentu varira s dubinom, karakteristikama sedimenta, blizinom obale i sl. Uzorci sedimenta su uzimani grabilom sa istraživačkog broda "Andrija Mohorovičić" u ljeto 1989. godine. Sediment je uziman na 6 postaja (20A, 20, 17, 16, 15, 11) u količini od 3 - 5 kilograma.

Gamaspektrometrijsko mjerenje uzoraka vršeno je na HPG detektoru rezolucije 1.95 KeV i efikasnosti 25% na 1.33 MeV, povezanog sa 4096 kanalnim analizatorom i kompjuterom.

