INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS OF THE BED LOAD SEDIMENTS, SAMPLED FROM THE ROMANIAN DANUBE RIVER, DURING 1993

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In a previous paper of GEORGESCU *et al.* (1979) it has been outlined the importance of the stable macro and micro elements concerning the transport and transfer of the radionuclides between water, suspended matter, sediments and biota. In this paper, samples of sediments from the significant verticals of the Romanian Danube river were collected as follows : Svinitza and Orsova (entrance of Danube river in Romania), before the Turnu-Severin dam and there after at Bechet in front of the Nuclear Power Plant KOZLODUI (kms. 705 and 678).

Samples were dried in an electric oven at 105°C, then homogenized in an agath mortar. Chemical analyses were performed for Al, Mg, Mn, P, Si and Ti. Loss of weight at 1000°C varied between 13.30% at Svinitza to 3.64% at Bechet km 678. For INAA, about 100 mg of each sediment sample in thin aluminium foil together with the Reference Materials were irradiated at the VVR-S Reactor of Bucharest, at a flux of 10^{11}-10^{12} n/cm^2.s. The measurements were performed with a HPGe detector of 2.2 keV at ^{60}Co coupled to a multichannel analyser.

At Svinitza-Orsova, the highest values are to be observed concerning the As, Br, Sb, Rare Earths, Th, U, Zn, while after Turnu-Severin dam, the chemical pollution is rapidly decreasing (Table 1).

Table 1. Instrumental Neutron Activation Analysis and Chemical Analysis* of the sediment samples from the Danube river during 1993.

Element	Svinitza (8.04.93)	Orsova (8.04.93)	Turnu-Severin (9.04.93)	Bechet (km 705) (17.04.93)	Bechet (km 687) (17.04.93)
Al* (%)	7.59 ± 0.23	7.30 ± 0.22	4.76 ± 0.14	4.04 ± 0.12	2.85 ± 0.09
As (ppm)	25.5 ± 0.50	23.6 ± 0.50	6.10 ± 0.30	7.30 ± 0.30	7.50 ± 0.30
Ba (ppm)	347 ± 41	530 ± 50	417 ± 40	364 ± 36	363 ± 35
Br (ppm)	5.5 ± 0.4	6.8 ± 0.6	1.8 ± 0.4	1.0 ± 0.3	0.9 ± 0.3
Ca (%)	2.18 ± 0.20	5.05 ± 0.25	4.57 ± 0.22	4.15 ± 0.20	1.78 ± 0.11
Ce (ppm)	72.5 ± 1.5	67.5 ± 1.4	24.3 ± 0.6	27.5 ± 0.6	18.1 ± 0.5
Co (ppm)	18.3 ± 0.6	18.6 ± 0.6	11.5 ± 0.3	8.7 ± 0.3	6.1 ± 0.2
Cr (ppm)	161 ± 6	161 ± 5	349 ± 7	56 ± 1	99 ± 2
Cs (ppm)	9.5 ± 0.5	9.1 ± 0.5	2.5 ± 0.2	1.7 ± 0.2	0.9 ± 0.1
Eu (ppb)	990 ± 85	867 ± 81	509 ± 45	566 ± 52	418 ± 40
Fe (%)	4.34 ± 0.06	4.11 ± 0.06	2.24 ± 0.04	1.52 ± 0.02	1.16 ± 0.02
Hf (ppm)	4.4 ± 0.2	2.8 ± 0.2	2.0 ± 0.1	1.9 ± 0.1	1.5 ± 0.1
K (%)	1.70 ± 0.05	1.60 ± 0.05	2.24 ± 0.07	0.95 ± 0.04	0.92 ± 0.04
La (ppm)	26.1 ± 0.4	31.7 ± 0.5	9.2 ± 0.2	13.0 ± 0.3	7.8 ± 0.2
Lu (ppb)	940 ± 90	326 ± 20	217 ± 12	152 ± 9	146 ± 8
Mg*(%)	1.23 ± 0.04	0.89 ± 0.03	0.65 ± 0.02	0.52 ± 0.02	0.52 ± 0.02
Na (%)	0.57 ± 0.01	0.50 ± 0.01	1.37 ± 0.02	1.07 ± 0.01	0.93 ± 0.01
Mn*(ppm)	387 ± 11	542 ± 15	775 ± 22	620 ± 20	620 ± 20
Rb (ppm)	113 ± 10	99 ± 9	57 ± 5	44 ± 4	39 ± 4
P* (ppm)	131 ± 3	611 ± 13	350 ± 10	305 ± 10	305 ± 10
Sb (ppm)	4.4 ± 0.2	4.0 ± 0.2	0.3 ± 0.1	0.3 ± 0.1	0.3 ± 0.1
Sc (ppm)	13.8 ± 0.1	13.4 ± 0.1	9.2 ± 0.1	5.2 ± 0.1	3.9 ± 0.1
Si* (%)	20.22 ± 0.40	19.70 ± 0.40	33.63 ± 0.67	31.61 ± 0.63	37.25 ± 0.75
Sm (ppm)	6.54 ± 0.06	5.53 ± 0.05	2.17 ± 0.02	2.47 ± 0.03	1.50 ± 0.02
Ta (ppb)	850 ± 130	650 ± 127	356 ± 72	476 ± 95	242 ± 60
Tb (ppb)	1000 ± 150	730 ± 156	410 ± 82	375 ± 74	196 ± 41
Ti* (%)	0.28 ± 0.01	0.23 ± 0.01	0.48 ± 0.01	0.39 ± 0.01	0.45 ± 0.01
Th (ppm)	27.0 ± 0.2	10.3 ± 0.2	4.4 ± 0.1	3.9 ± 0.1	2.2 ± 0.1
U (ppm)	3.6 ± 0.5	2.4 ± 0.4	1.3 ± 0.2	1.2 ± 0.2	0.8 ± 0.2
Yb (ppm)	5.3 ± 0.6	2.4 ± 0.2	1.9 ± 0.1	1.1 ± 0.1	1.0 ± 0.1
Zn (ppm)	356 ± 20	539 ± 45	142 ± 12	80 ± 8	49 ± 5

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