Evolution of 134Cs, 137Cs, 238U and 230Th on the Romanian Littoral of the Black Sea

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ABSTRACT. Bottom sediments and biota (i.e. mussels *Myt.g.*) were sampled in view to explain the evolution of radionuclides from the North to the South on the romanian littoral, correlated with the liquid and solid discharge of the Danube river as well as with the marine currents.

INTRODUCTION. In view to explain the nuclear pollution of the romanian littoral, correlations are made between the liquid and solid discharge of the Danube river as well as the north to the south marine currents. The radioactivity of the man made radionuclides ^{134}Cs, ^{137}Cs, as well as of the U-Ra and Th natural families were correlated with the hydrological data. A global indicator for total radioactivity in a named cross section and its evolution between two cross sections is defined.

MATERIAL AND METHODS. Bottom sediments were sampled together with the mussels *Mytilus g.* The sediments and the mussels only the soft tissue were dryed at 105°C. The radioactive counting was carried out making use of a high resolution Ge(Li) detector coupled to a multichannel analyzer. The ^{134}Cs of 2.07 y and ^{137}Cs of 30 y were identified together with ^{238}U and ^{230}Th. The radionuclidesflow can be defined by the eq. :

$$C = \sum c_{w_i} \cdot Q_w + \sum c_{s_i} \cdot Q_s + \sum c_{b_i} \cdot Q_b + \sum c_{l_i} \cdot Q_l \qquad (1)$$

where c_{w_i} , c_{s_i}, c_{b_i}, c_{l_i} refer to the activities in $Bq \cdot m^{-3}$, or $Bq \cdot Kg^{-1}$ in water (w), suspended matter (s), bottom sediments (b) and biota (l) ; Q_w, Q_s, Q_b, Q_l are liquid discharge, suspended discharge, bed load discharge and biota discharge in $m^3 \cdot s^{-1}$, or in $Kg \cdot s^{-1}$. In function of geographical coordinates (of the cross section, the flow $C(Bq \cdot s^{-1})$ has the following equation:

$$C = C_c \quad \text{or} \quad C = C_c + C_D \qquad (2)$$

where C_c is due to marine currents, while C_D is due to the Danube river. Noting by j = I, II, ... the measurement cross-sections from the North to the South, we can define the nuclear coefficient pollution as follows:

$$K_{dilution} = (C_{j+1} - C_j)/\Delta L \quad Bq \cdot m^{-1} \cdot s^{-1} \qquad (3)$$, where ΔL is the distance between the two cross-sections. This coefficient $K_{dilution}$ is a global indicator of the nuclear pollution evolution. It must be outlined, $K_{dil.}$ is depending of physico-chemical parameters, current velocity, geological characteristics of bottom sea (mineralogical composition the grain size, etc.). Our measurements cross-sections are taking into account the marine currents in the littoral site (Fig.1) /1/.

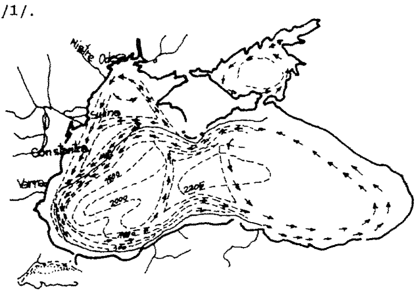

Fig. 1. Map of the cyclonic currents of the Black Sea (Knipovici)

The sampling and computing methods for evaluation the nuclear pollution is indicated in /2/.

RESULTS AND CONCLUSIONS. In Table 1 are presented only the radioactive measurements of the bottom sediments /3/.

Table 1. The radionuclides identified in the bottom sediments in 1989. Bq.Kg^{-1} dry matter

Sample	^{134}Cs	^{137}Cs	^{238}U	^{232}Th
Sediment (Sulina)	1.9 ±0.5	33 ± 2	21 ± 2	22 ± 2
Sediment (Sf.Gheorghe)	4.8 ±0.5	39 ± 2	14 ± 2	16 ± 2
Sediment (Portitza)	0.8 ±0.5	119 ± 5	43 ± 3	58 ± 3
Sediment (Constantza)	5 ± 1	42 ± 2	18 ± 1	15 ± 2

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