



## NATURAL AND ARTIFICIAL RADIONUCLIDES IN THE NORTH-WESTERN BLACK SEA BASIN.

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The paper presents results of a long-term radioactivity surveillance programme in the North - Western Black Sea basin. Natural and artificial radionuclides are determined since 1984 in the frame of two national programmes: the national environmental radioactivity surveillance programme, that assures the continuous surveillance along the coast, based on principles of emergency monitoring and the trend monitoring programme of the marine environment. Data on samples provided as part of the EC EROS-2000 project, in the period of 1995-1997, are also included.

About 1000 samples of water, sediment and biota were analysed for gamma emitting radionuclides by use of high resolution, low background spectrometric equipment. Evaluation of spectra was done using a dedicated software developed in our laboratory. The quality of data is controlled by taking part in intercomparison runs organised by the IAEA.

Both natural and artificial radionuclides are discussed with respect to levels, distribution and behaviour, and overview of sources. The accent is placed on artificial radionuclides from the atmospheric nuclear weapon testing programme and from the Chernobyl accident that constitute the principal source of anthropogenic radioactivity in the region. The time-series evolution of weapon and Chernobyl derived Cs-137 is shown in figure 1. Present levels (1995-1997) of Cs-137 in surface water of the north-western Black Sea are in the range of 14.9 - 44.5 Bq/m<sup>3</sup>, depending by the proximity to the rivers inflow.

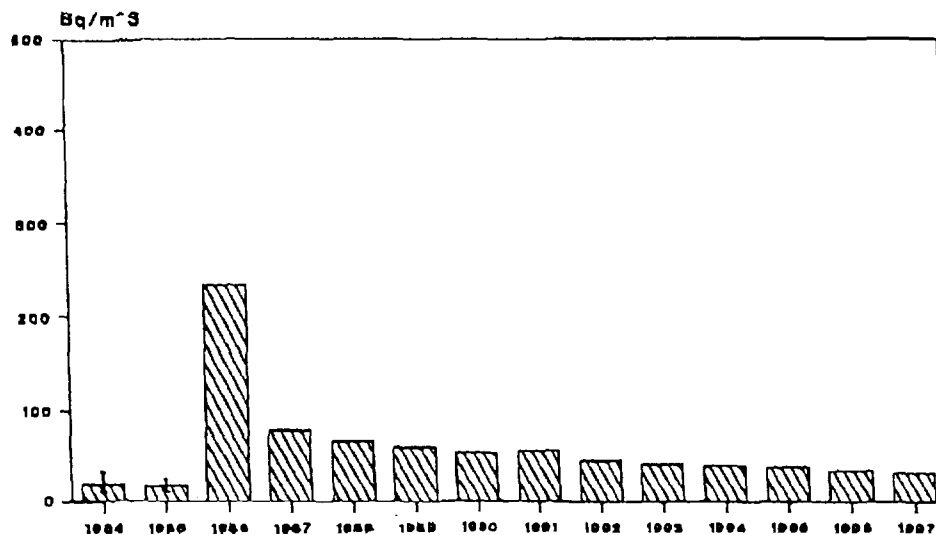


Figure 1. Levels and dynamic of Cs-137 in surface water of the north-western Black Sea basin.

Measurement data on Danube water collected on daily bases (shown in figure 2) [1], and [2] and liquid discharge data from cross-sections on the three Danube Branches were used to estimate the annual fresh water inflow of Cs-137. The magnitude of the Danube concentrations and fluxes are also used to illustrate the movement of both fresh and marine water in the region of Danube inflow.

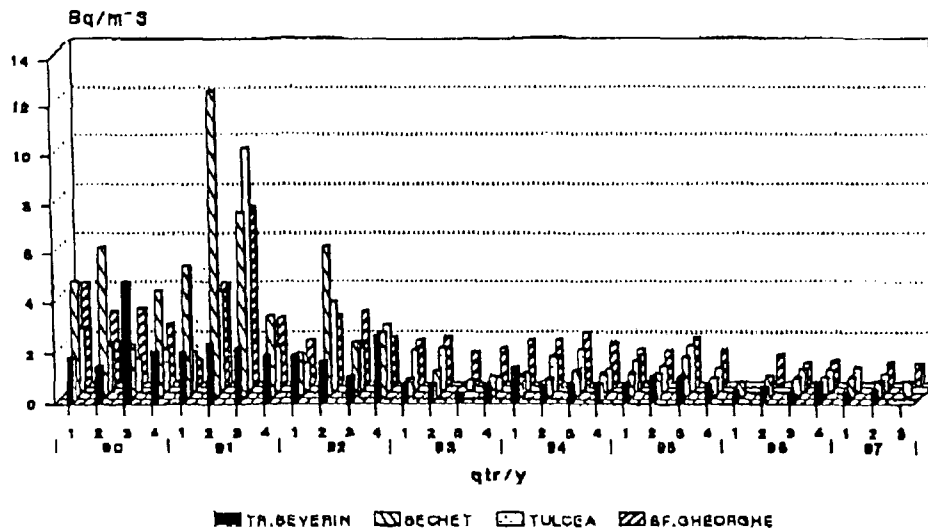


Figure 2. Levels and distribution of Cs-137 along the lower Danube river.

Measurements on sediment samples of both shelf region near the Danube and the Dnieper and in offshore stations in the N-W Black Sea in the period of 1995-1997 indicate a large variability of radioactivity levels depending on the sedimentary textures. The current map of radioactivity of the north-western basin can be correlated with the sedimentological map of the region. Complex processes related to the general circulation and its local components, vertical fluxes and sedimentation, control the fate and distribution of radionuclides in this area. Higher levels of Cs-137, up to 160 Bq/kg dry and about 10 Bq/kg dry of Cs-134 are encountered in the zone of Danube Delta Front and Danube ProDelta where the currents hydrodynamic regime favours deposition of finer sediments. Levels of K-40 and Cs-137 in these regions are similar to those corresponding to sediments of the Danube Delta lakes [3]. Levels of 135 Bq/kg dry were determined in sediments of the Dnieper estuary, and about 20 Bq/kg dry at the Dniestr inflow zone. Typical levels for other sedimentary zones of the basin are of about 8 Bq/kg dry on the Crimean coast, 15 Bq/kg dry on the sediment starving shelf and 1-2 Bq/kg dry in the fan complexes and the abyssal plain.

#### REFERENCES:

- [1]. OSVATH I., - Monitoring of gamma emitters in sediment and water sampled along the Romanian sector of the Danube, in the Danube Delta and the Romanian area of the Black Sea, IAEA RC no. 5786/RB. (1990-1992).
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- [3]. RUZSA G., - Report on the radioactivity of water and sediment from the Danube, Danube Delta and the Black Sea. EU- EROS 2000 RC no. 95-0339 (1995-1997).