

¹³⁷CS INVENTORIES IN THE WATER COLUMN AND IN SEDIMENTS OF THE WESTERN MEDITERRANEAN SEA

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With the aim of calculating the inventory of ¹³⁷Cs in the Mediterranean Sea, a study was carried out in the Western Mediterranean on present levels and inventories of this radionuclide in the water column and in sediments of the open sea environment. In recent years only few data have been published on the subject (CALMET and FERNANDEZ, 1990; IAEA MEL, 1991). Two sampling campaigns have been carried out in 1991 and 1992, collecting water and sediment samples, covering most of the Western Mediterranean basin. All the sampling stations were located in areas with water depth greater than 800 m. A Rosette sampler, equipped with a CTD probe and 12 X 30 litres Go-Flo bottles, was used to determine the hydrological characteristics of the water column and to collect water samples representative of the different W-Mediterranean water masses. Sediment samples were collected by a modified Reineck box-corer. The samples were sectioned onboard in layers 1 cm thick. ¹³⁷Cs was determined by γ -spectrometry: a) on 100 l of unfiltered seawater, after pre-concentration on AMP and b) on dried and blended sediments.

The vertical profiles of ¹³⁷Cs in the water column are shown in Fig.1. The concentration of ¹³⁷Cs in sea-water decreases from the surface to depth. A slight increase in ¹³⁷Cs concentration is observed near the bottom, likely due to resuspension of sediment from the sea-floor. The shape of these vertical profiles is very similar to that reported for the Western Mediterranean Sea in the pre-Chernobyl period (FUKAI *et al.*, 1980, BALLESTRA *et al.*, 1984), but in the 1991-92 samples a decrease in ¹³⁷Cs concentration in surface waters and an increase in the underlying water masses is observed. The inventories of ¹³⁷Cs in the water column (Fig.2) range from 2.2 to 6.8 kBq/m², in relation to water depth. However, the inventories of ¹³⁷Cs in the layer 0-600 m (corresponding to the layer Modified Atlantic Water + Levantine Intermediate Water) are rather homogeneous in the Western Mediterranean, with a mean value of 1.7 ± 0.3 kBq/m².

The inventories in the Western Mediterranean Deep Water (layer 600 m to bottom) are proportional to the depth of the water column, ranging from 0.7 kBq/m² at 830 m to 4.8 kBq/m² at 2770 m. ¹³⁷Cs in sediments has been presently measured at two stations, the first one located SW of Sardinia and the second one in the channel between Ibiza and the Spanish coast, at water depths of 1025 m and 828 m, respectively. ¹³⁷Cs is only detectable in the first 10 cm. Its concentration decreases regularly from a surface value of 6 - 7 Bq/kg. The inventories of ¹³⁷Cs are very similar at these two sites (233 and 228 Bq/m²), and correspond to about 5% of the cumulative fallout deposition at the latitude of the Mediterranean and to about 6-9% of the total inventory at these stations.

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REFERENCES

- FUKAI R., BALLESTRA S. and VAS D., 1980. Distribution of ¹³⁷Cs in the Mediterranean Sea, in: Management of the environment, Wiley Eastern Ltd., New Delhi-Bombay, 353-360.
 BALLESTRA S., BOJANOWSKI R., FUKAI R. and VAS D., 1984. Behaviour of selected radionuclides in the Northwestern Mediterranean basin influenced by river discharge. In: International symposium on the behaviour of long-lived radionuclides in the marine environment, Cigna and Myttenaere eds. EUR 9214, CEC, Luxembourg, 215-232.
 CALMET D. and FERNANDEZ J.M., 1990. Caesium distribution in northwest Mediterranean seawater, suspended particles and sediments. *Cont. Shelf. Res.*, 10 : 895-914.
 IAEA MEL, 1991. International Marine Environment Laboratory - Monaco, Biennial report 1989-1990, IAEA Vienna, 81 pp.

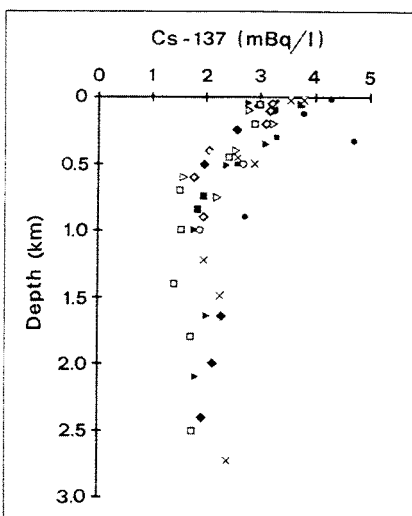


Fig.1 - Vertical profiles of ¹³⁷Cs in the water column.

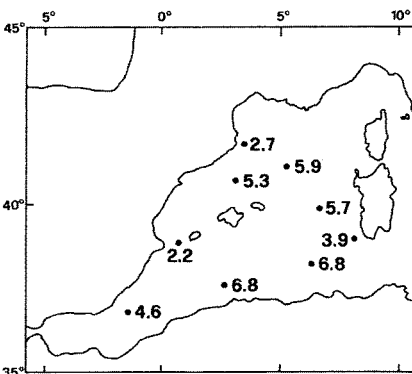


Fig.2 - Inventories of ¹³⁷Cs (kBq/m²) in the water column

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