^{137}CS AS A TOOL FOR INVESTIGATING THE MIGRATION OF POLLUTANTS VIA WATER MASS MOVEMENT BETWEEN TWO DIFFERENT BASINS

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The northeastern Aegean Sea is an area where the Black Sea (B.S.) water mass interacts with Aegean Sea waters through the Dardanelles (Fig. 1). As the B.S. waters enter the Aegean Sea (A.S.), they are diluted in the northern and the western part of the A.S. The upper layer of the B.S. water mass is characterized by low salinitiy values, which produce high stability of buoyancy conditions. Thus, the upper layer (0 50 m) of the entire water column comes out to the A.S. through the Dardanelles, a narrow channel of 90 m maximum depth (NITTIS *et al.*,1990).

The situation outside of the mouth of Dardanelles in the A.S. is completely different, characterized by higher salinity values, deeper depths and strong currents during the cold period. The volume of water coming from B.S. is insignificant (300-700 km^3 annually) as compared with the total water volume of the eastern A.S. (90000 km^3)° however, the upper layer of the northern and western part of the A.S. is greatly affected by the B.S. water flux (Fig. 1).

The Chernobyl nuclear accident on 26 April 1986 resulted in a deposition of about 530 TBq of ^{137}Cs in the A.S. (KRITIDIS and FLOROU, 1990). The respective amount for the B.S. is about 2400 TBq. Since ^{137}Cs is re-suspended from the B.S. sediments and the river outflows deliver contaminated terrestrial material to the B.S., an amount of about 250 TBq is estimated to remain in the 0-50 m water layer based on data for the period 1986-1991 (EGOROV *et al.*, 1994). This amount is expected to be discharged from the B.S. into the Sea of Marmara and consequently to the northeastern A.S. through the Dardanelles channel.

According to our ^{137}Cs measurements of surface sea water during 1993, it was shown that approximately 48 TBq of ^{137}Cs was the 1993 discharge to the A.S. due to the purification process of the B.S. (FLOROU and KRITIDIS, 1994). Thus, we assume that the mouth of Dardanelles is a definite "point source of pollution" for the eastern Mediterranean with a more or less predictable amount of ^{137}Cs discharge. Considering the generic inventory of ^{137}Cs in the A.S. during 1993, the average concentration of ^{137}Cs in the mouth of Dardanelles close to the A.S. is 118 ± 8 Bq m^{-3}, whereas the mean estimated value for the A.S. is 20.7 ± 14.7 Bq m^{-3} (FLOROU *et al.*, 1994). This value is quite high if compared with the pre-accident levels (2.6 ± 0.3 Bq m^{-3} for the period 1984-85 reported by FLOROU (1992), or with the respective value for the Ionian Sea, 9.2 ± 2.5 Bq m^{-3} (FLOROU, 1994). If we look at the dispersion of ^{137}Cs, we note that this can reflect the surface current circulation pattern in this area, since the B.S. waters may be traced periodically from north to south in the A.S. region (Fig. 1).

The above considerations are being studied further and a model of ^{137}Cs dispersion based on meteorological and oceanographic data is now under evaluation. Since ^{137}Cs is a soluble tracer with a slow removal time from the water column, it could be used for the prediction not only of the dispersion of radioactive substances, but also of conventional pollutants.

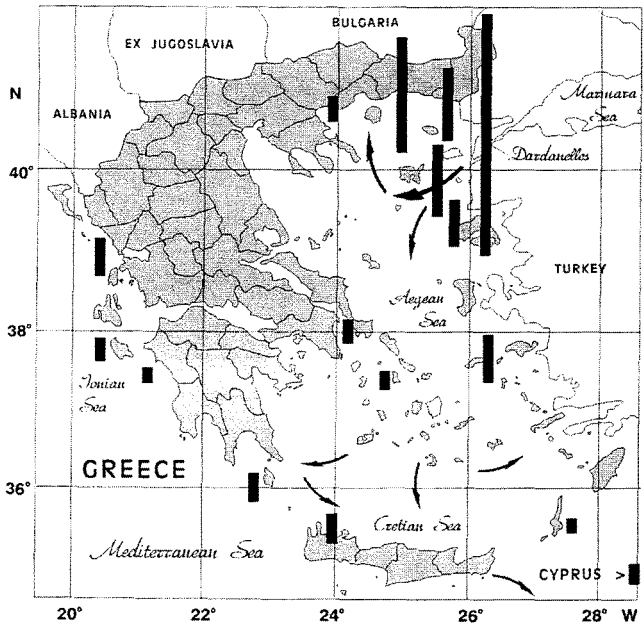

Fig. 1 : Concentrations of ^{137}CS and main directions of surface currents in the Aegean Sea (Florou and Kritidis, 1994; Zodiatis, 1993)

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