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The radiological profile of the north and the central Aegean Sea for 137Cs, the water masses carriers, and their spread

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The Black Sea is connecting to the Aegean Sea through the Dardanelles Strait and determine the hydrological structure of the area, providing low salinity surface water at the North which is moved southwards along the western shores of the sea, following a generally cyclonic circulation. The data represented in vertical plots combining oceanographic parameters and the radiotracer's ¹³⁷Cs activity concentration values, for a better representation and understanding of the mixing and circulation of the water masses.
The way that ¹³⁷Cs distributed through the marine masses in the overall area of the north and the central Aegean Sea is described detailed. This area is a starting point of one of the heaviest loaded carriers of ¹³⁷Cs, the Black Sea Water (BSW) mass. Heavy load from the deposition area of the Black Sea outflows from the strait of Dardanelles and spread directly, and mixes with the other local water masses. Starting with a concentration at the outflow ≥ 7 Bq/m³ it spreads in an area, where the load afterward varies from 1.6 to 5.5 Bq/m³. Cs is mostly present in soluble form, while partly absorbed from the particular matter in a small percentage. Following the path of Cs, and analysing its strong influence on the different stratified layers of water masses in the basins, any concentration ≥ 3 Bq/m³ is, generally, attributed to the influence of the BSW.

BSW mixed with the surface waters of the North Aegean, creates mixtures of greater density, as shown by the characteristics of the surface and intermediate waters, examined in the basins under study, the Black Sea waters branch at their exit in 2 main parts. The one part follows a northern course parallel to the coastline of Northern Greece and later descends to the central Aegean, while the second branch leads south with strong mixing and sharp thickening of its features around the central plateau of the central Aegean. Is evident from our combined types of graphs, Θ/S graphs and those incorporating as a parameter the ¹³⁷Cs concentrations, how the waters of the Black Sea substantially contribute to the creation of a new marine mass called Transitional Subsurface Aegean Water (TSAW), since the radiological load of the remaining marine masses would not allow the formation of this marine mass. At the same time the substantial contribution of upper marine masses to the final load of ¹³⁷Cs in the bottom masses, as shown also by other studies i.e., Cretan Deep Basin in the southern part of the Aegean, phenomena of over-accumulation are directly related to the residence time of the water masses.

There are specific graphic areas where the points of those water masses can be depicted. The spectrum for each of them becomes clearer as more parameters we add for the determination. When an artificial radioisotope is added as a parameter, the characterization becomes easier, because there are no possible natural sources.
Further interactions with the Levantine's water entering from the Aegean through the Karpathos Straits, and extends all the way to the surface along the eastern shores of the Central Aegean, once again highlighted in this research.

Adapting more radioisotopes, like ²³⁶U, and the development of a standard model for characterisation and identification of the marine masses, incorporating artificial radioisotopes with natural ones, are necessary steps for an integrated environmental radiology analytical method, providing information about radio-isotopic depositories.

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