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The use of ^{137}Cs as a tracer in studying vertical mixing in the Aegean Sea

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The use of radionuclides as tracers is a well-established method of assessing circulation in oceanography. The Chernobyl accident (26 April 1986) has provided a tool to the oceanographic community of the Mediterranean and Black Seas for the study of processes like circulation, the dispersion of Black Sea Waters in the Mediterranean and mixing of different water masses. This work addresses the last subject.

In detail, this study deals with the very dense waters of high ^{137}Cs concentration that were formed during the Eastern Mediterranean Transient forcing event in the winters of 1992-1993 in the Aegean Sea. The waters that filled the deep basins of the Aegean during that time have not been ventilated since, and they have become a source of ^{137}Cs for the intermediate layers.

A one-dimensional model is constructed, balancing the diffusive mixing of ^{137}Cs concentration with the rate of temporal change of the mean values in the deep, secluded basins of the Aegean Sea. The model is based on an earlier model that addressed the balance between buoyancy flux and rate of change of density, which led to the estimation of vertical eddy diffusion coefficient profiles for three basins of the North Aegean Sea. This information is compared with the results of the ^{137}Cs-evolution model. Observations of dissolved oxygen concentration are also exploited in an attempt to estimate the age of the deep water and the intensity of vertical mixing.

The above analytical methodology is applied on density, ^{137}Cs and dissolved oxygen concentration observations from the deep waters of the South Aegean Sea, in an effort

to identify their major origin. Finally, we present the outline of a long-term monitoring strategy, in the lines of a current Greek-Italian collaborative project, as a contribution to studies of thermohaline circulation variability and climate change.