

MIXING STUDIES BASED ON STABLE ISOTOPES AND TRITIUM  
IN THE BLACK SEA AND THE SEA OF MARMARA

1632

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The stable isotopes oxygen  $^{18}\text{O}$  and deuterium  $^2\text{H}$ , together with the transient tracer tritium,  $^3\text{H}$ , are used to identify origins and characteristics of distinct water masses in the Black Sea, and in its smaller neighbour, the Marmara Sea, connected between them and to the Mediterranean Sea through the Straits of Bosphorus and Dardanelles respectively. Exchange through the system and the water mass formation and evolution are characterised, based on the isotope measurements. Spatial coverage including the shelf and deep regions, with improved accuracy and reduced noise provide definitive assessments of pycnocline and deep mixing in the system, and show the influence of fresh water in the western Black Sea continental shelf. The surface waters of the Black Sea including the lower pycnocline and the deeper basin have different regimes of mixing. The pycnocline in both the Marmara Sea and the Black Sea represents an efficient barrier to mixing, but the time evolution of the surface characteristics in the two seas differ, as a result of mixing with the underlying waters. Rapid changes in the properties occur across the Turkish Straits.