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Eastern Mediterranean deep water renewal on the basis of chlorofluoromethane and tritium data

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Abstract

Simultaneous chlorofluoromethane (CFM) and tritium data obtained in the eastern Mediterranean during the POEM survey of the F/S Meteor in 1987, supported by tritium data taken in 1978, indicate that the deep water in the eastern Mediterranean below about 1200 m deep forms a coherent thermohaline convective system. The data are interpreted by means of a conceptual numerical model of the renewal, recirculation and mixing of the waters below about 1000 m depth. The model gives a replacement of the waters below 1400 m depth, by waters from above 1000 m depth, converted by way of the Adriatic, of 2.9 Â± 0.9 10^5 m^3 $s^{â^'1}$. This rate corresponds to between about 15 and 40% of the total water exchange through the Straits of Sicily. Relative to their respective surface water time histories, much less tritium than CFM Freon 12 (F 12) is present in the deep water. This is interpreted as a consequence of the different modes

of oceanic input for the two tracers. Similar tritium deficits are predicted to be a common phenomenon in ocean waters, and are believed to provide a useful oceanographic tool. In the present context, it is the tracer combination that provides the constraint on the convective deep water renewal. Furthermore, the tritium data suggest that the majority of the water converted in the deep water formation process (in the southern Adriatic) was stored beforehand as intermediate-depth water for several years. The F 12 data require that most of this water subsequently came into convective contact with the air-water interface for more than a month.

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