The Mediterranean water intrusion and double diffusive convective mixing processes in the Black Sea

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A description of internal processes of convective - diffusive mixing in the Black Sea is given, based on a number of recent data sets.

The Mediterranean waters entering into the Black Sea are rapidly mixed with cold waters on the continental shelf (LATIF *et al.*, 1991) and sink to intermediate depths (≤ 500m), forming a series of cold intrusions spreading horizontally into the interior (OZSOY *et al.*, 1992a, b). The temperature, salinity, suspended load and some other properties of the intrusions can often be traced back to the source region near the southwestern margin. The intrusions result in a unique mechanism of convection partially supported by the unstable double diffusive regime of the interior. The time-dependent convective motions can lead to significant exchange across the permanent halocline, and may explain some peculiarities of the Black Sea interior stratification.

Continental shelf dynamics and coherent structures of the Black Sea circulation locally modify the transport by the intrusions. The interaction of cyclonic boundary currents with the abrupt topography of Sakarya Canyon, and instabilities of the boundary currents motivate cross-shelf transport of the shelf sediments via intrusions and filaments.

Geothermal heat fluxes acting on an otherwise tranquil deep water mass drive a bottom convective layer (OZSOY *et al.*, 1992a, MURRAY *et al.*, 1991). Laboratory experiments and available theory are far from explaining its evolution, but the time of origin of the convective layer is inferred to be of the same age as the formation of bottom waters. The absolute homogeneity of the properties of this layer everywhere in the Black Sea suggests efficient mixing by turbulent eddies. The characteristic time scale of overturning implies a homogenisation period of at least several hundreds of years, required for the entire basin. This may explain the observed continuity of bottom sediment layers within the basin.

The transports between the bottom and the upper layer waters appear to be determined by a diffusive interface at the top of the convective layer, and double diffusion in the water column. A peculiar thermostad separates the pycnocline region from the deep waters. Anomalous temperature fine structure can be observed at all depths in the water column, and appears to be larger near the basin lateral boundaries.

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