



## Abstract View

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# Double Diffusion and the Distribution of the Density Ratio in the Mediterranean Waterfront Southeast of the Azores

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### ABSTRACT

Temperature and salinity ( $T$ - $S$ ) finestructure on vertical scales of 10 db and larger is examined in a 500 by 500 km grid located southeast of the Azores in the North Atlantic. The convergence of several water masses dominated by the Mediterranean Water (MW) at mid-depth (1000 m) leads to variety of  $T$ - $S$  finestructure which is unstable to double diffusive processes. By forming histograms of the density ratio  $R_\rho$ , a fundamental parameter in controlling double diffusive processes, it is found that 71% of the volume is unstable to salt fingering while only 5% is unstable to diffusive layering, the other double diffusive instability. In about 24% of the volume,  $R_\rho$  is less than 2 in the salt fingering sense and at these low values salt fingers grow rapidly. This suggests that salt fingering may be an important diapycnal mixing process in much of the region. Two primary salt fingering regions are found: a near-surface region from about 100 to 500 db with a modal  $R_\rho$  of 2.0 and a deeper region from about 1000 to 1500 db (the maximum depth of the CTD survey) with a modal  $R_\rho$  of 1.3. A horizontal map of  $R_\rho$  in the lower region shows that on average the lowest values ( $R_\rho \leq 1.25$ ) are found under the MW pool, although other, isolated regions of low  $R_\rho$  are found to the south. A map of the rms  $R_\rho$  fluctuation  $\Delta R_{\rho \text{rms}}$  in the lower region shows that the most vertically uniform  $R_\rho$  profiles also occur under the MW pool. High levels of  $\Delta R_{\rho \text{rms}}$  are found within a region containing a strong cyclonic meander described by Käse and Zenk and may result from increased isopycnal mixing activity. To examine the occurrence of thermohaline staircase structures which have been found previously in the Mediterranean Outflow, a "steppiness index" is defined which detects step and layer finestructure on vertical scales of 20 db and larger. Staircase structures on these scales are found most frequently to the south of the Azores Current in the inner gyre waters. These structures are generally not found above 1500 db under the MW pool.

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