DOUBLE DIFFUSION IN THE CAPE VERDE FRONT

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Summary

The Cape Verde frontal zone corresponds to the southern limit of the North Atlantic thermocline recirculation (Stramma and Siedler, 1988). It stretches southwest from Cape Blanc to the Cape Verde Islands, and effectively separates relatively new (salty, warm, nutrient-poor, and oxygen-rich) North Atlantic Central Waters NACW from the older (fresh, cold, nutrient-rich, and oxygen-poor) South Atlantic Central Waters SACW. Strong gradients across the front are observed in distributions of salinity, nutrients and dissolved oxygen, while potential temperature (θ) shows a much smoother distribution (Fig.1). Furthermore, in θ-property diagrams, hydrographic data smoothly spreads through the domain limited by the NACW and SACW source water types. However, when other property-property diagrams are plotted, data points converge towards the line defined by either source water type. A plausible explanation is the existence of salt-finger double diffusion. The Turner angle (Ruddick, 1983) is computed in order to quantify salt fingering in the frontal zone, and its distribution indicates that strong fingers are associated with the frontal system (Fig. 1). A conceptual model is proposed to explain how salt fingering enhances horizontal heat diffusion that results in a smoother distribution of temperature across the front.

FIGURE 1. DISTRIBUTION OF (A) POTENTIAL TEMPERATURE, (B) SALINITY, (C) NITRATE CONCENTRATION AND (D) TURNER ANGLE ALONG A SECTION PARALLEL TO THE AFRICAN COAST ON THE SLOPE FROM 26.12°N TO 17°N.

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