DOUBLE DIFFUSION IN THE CAPE VERDE FRONT

Maria V. Pastor [a], J.L. Pelegrí [a], A. Hernández-Guerra [b], J. Font [a], J. Salat [a], and M. Emelianov [a]

[a] Institut de Ciències del Mar, CSIC, Passeig Marítim de la Barceloneta 37-49, 08003 Barcelona

[b] Facultad de Ciencias del Mar, Universidad de Las Palmas G. C., Las Palmas, Spain

mpastor@icm.csic.es, pelegri@icm.csic.es, ahernandez@dfis.ulpgc.es, jfont@icm.csic.es, salat@icm.csic.es, mikhail@icm.csic.es

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.

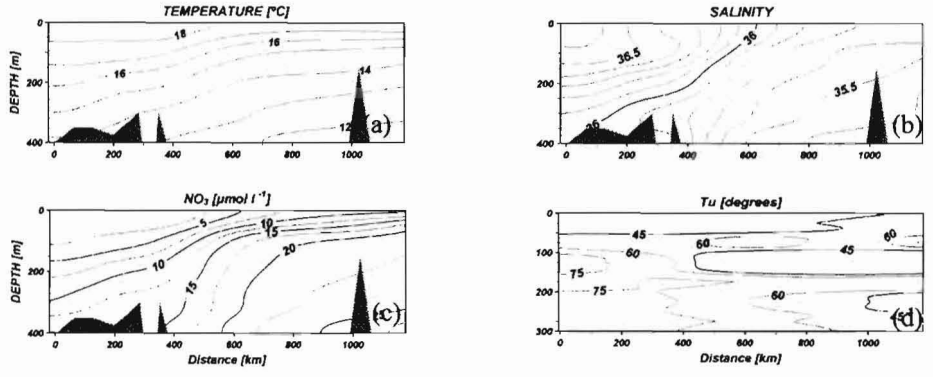

FIGURE 1. DISTRIBUTION OF (A) POTENTIAL TEMPERATURE, (B) SALINITY, (C) NITRATE CONCENTRATION AND (D) TURNER ANGLE ALONG A SECTION PARALLEL TO THE AFRICAN COAST ON THE SLOPE FROM 26.12°N TO 17°N.

Aknowledgements

This research has been supported by the Spanish Ministerio de Educacion y Ciencia, through project CANOA (Ref. No. CTM2005-00444/MAR). MVP would like to acknowledge Consejo Superior de Investigaciones Científicas for funding through an I3P grant.

References

Ruddick, B.R., 1983. A practical indicator of the stability of the water column to double-diffusive activity. Deep-Sea Research 30, 1105–1107.

Stramma, L., and G. Siedler, 1988. Seasonal changes in the North Atlantic Subtropical Gyre. Journal of Geophysical Research 93, 8111–8118.