



## Abstract View

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# Variability of Potential Energy, Dynamic Height and Salinity in the Main Pycnocline of the Western North Atlantic

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### ABSTRACT

Hydrographic data in the upper 2 km from the period 1914–73 have been analyzed in the western North Atlantic (22–36°N, 66–74°W). Expendable bathythermograph (XBT) data were also analyzed and compared with the hydrographic data. Means and standard deviations of the 15 and 17°C depths are comparable for the two data sets if only those XBT's reaching 700 m depth are used. Biased statistics result from use of a mixture of deep (T-7) and shallow (T-4) XBT'S.

Evident in the main pycnocline (~ 500–1200 m depth) are statistically significant vertical and horizontal changes of potential energy, dynamic height standard deviation ( $\sigma_{\Delta D}$ ) and salinity standard deviation ( $\sigma_s$ ) on potential density surfaces.

North of 28°N, which lies at the southern boundary of the Gulf Stream Return Flow, potential energy and  $\sigma_{\Delta D}$  both increase markedly toward the north and west. Although the increase in frequency of Gulf Stream Rings toward the Gulf Stream contributes to the gradient, the pattern is not associated solely with Rings, i.e., there are contributions from less energetic features. South of the Return Flow there is a narrow eastward flowing countercurrent which has its maximum expression above 200 db.

At the southern boundary of the Return Flow the high-salinity tongue of Mediterranean Sea Water is centered near 29°N between 600 and 1700 m. The tongue abruptly ends near the western boundary; comparison with maps drawn from selected stations suggests that the axis of the tongue varies considerably in latitude.

The  $\sigma_s$  decreases from largest values at shallow depth to a minimum near 18°C; there is a two- to three- fold increase

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to a maximum in the main pycnocline; and below the pycnocline the values decrease three- to fivefold. This  $\sigma_s$  vertical structure is uniform within the region whereas there is a marked horizontal variation of potential energy and  $\sigma_{\Delta D}$ . The vertical variation of potential energy south of 30°N is small but north of this latitude maximum potential energy occurs in a tongue centered in the main pycnocline.

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