Abstract View

Volume 16, Issue 5 (May 1986)

Journal of Physical Oceanography
Article: pp. 814–826 | Abstract | PDF (1.12M)

Baroclinic Flow and Transient-Tracer Fields in the Canary–Cape Verde Basin

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(Manuscript received April 8, 1985, in final form September 13, 1985)

DOI: 10.1175/1520-0485(1986)016<0814:BFATTF>2.0.CO;2

ABSTRACT

Simulated transient-tracer distributions (tritium, ^{3}H3, freons) on the isopycnal horizons σ_0=26.5 and 26.8 kg m^{-3} are presented for the East Atlantic, 10° −40° N. Tracer transport is modeled by employing a baroclinic flow field based on empirical data in a kinematic isopycnal advection-diffusion numerical model, in which winter convection is taken as the mechanism of communication with the ocean surface layer, and the isopycnal diffusivity is a free parameter. Diapucnic transport is ignored. The simulations employ time-dependent tracer boundary conditions, which are constructed on the basis of available observations. Simulations are compared to data obtained on a meridional section in 1981 (F/S *Meteor*, cruise 56/5). Best simulations were obtained by means of a subjective optimization procedure. On both levels, the observed distributions and the best simulated distributions agree well. The fact that the surface boundary conditions and interior distributions of the tracers are distinctly different leads us to the conclusion that our model provides a consistent description of upper main-thermocline ventilation and interior transport Surface-water densities in February are found to represent adequately the winter outcrop boundaries with an uncertainty of about ±300 km across. The required isopycnal diffusivity south of 29°N is 1700 m^2 s^{-1}, and 2900 m^2 s^{-1} further north (+70/−40%). Interior transport is found to be predominantly advective. Advective ventilation across 30.5°N east of 33°W amounts to only 12% and 40% for the 26.5 and 26.8 horizons of the total ventilation rates reported by Sarmiento. The North Atlantic/South Atlantic Central Water boundary near 15°N is found to be predominantly determined by advection.

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