Journal of Physical Oceanography
Article: pp. 1233–1257 | Full Text | PDF (3.75M)

Climatological Coastal Jet Collision, Intermediate Water Forma General Circulation of the Red Sea*

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(Manuscript received May 5, 1996, in final form November 18, 1996)
DOI: 10.1175/1520-0485(1997)027<1233:CCJCIW>2.0.CO;2

ABSTRACT

The authors present climatologies of a numerical model of the Red Sea, focusing on the dynamics of winter intermediate water formation. Northward flowing boundary currents are identified as the major dynamical elements. At the northern boundary, the eastern current follows the geometry, eventually turning back to the south. At ~ 26°N and the western wall the two boundary currents collide. At the collision site, the denser eastern current subducts under the western boundary current. The subduction forces the western boundary current eastward into the interior. Convection communicates the surface fluxes to the downwelled plume and intermediate water forms. The estimated rate, 0.11 Sv (Sv $\equiv 10^6$ m^3 s^{-1}), agrees with previous estimates. The authors identify basin-scale sea-surface tilt to the north due to variable thermohaline forcings as the key dynamical variable. The resultant geostrophic eastward cross-channel flow interacts with the boundaries and creates upwelling and surface topography spatial patterns that drive the coastal jets. Upwelling-induced vortex stretching dominates the vorticity balance and governs the separation of the western boundary current from the western wall. The process ceases in the summer.