Abstract View

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A Numerical Study of the Steady Circulation in an Open Bay

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ABSTRACT

The steady-state circulation in a rectangular bay is studied numerically in a model of homogeneous water and vertical coasts. The competing influences of the surface winds and longshore currants flowing by the open side of the bay and the effect of the bathymetry are emphasized. For a wind-stress field that does not vary along the coast but decays linearly inshore from the open side of the bay, the mass-transport streamfunction contours form a gyre rotating in the sense of the wind-stress curl. A uniform continental shelf slope distorts the gyre by creating depth variations that cause vortex stretching. Consequently, the streamlines become more packed to the right of the down-slope direction. The nonlinearity tends to destroy symmetry by crowding streamlines in the direction of the induced current. The influence of large-scale ocean currents along the open side is normally confined to the outer half of the bay. When the wind is blowing against these currents, the influence of the wind creates two gyres, one each at the inshore corners of the bay.