Abstract View

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The Effect of Bathymetry on the Coastal Upwelling of Homogeneous Water

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ABSTRACT

The influence of bathymetry upon the wind-driven, steady-state coastal upwelling motion of homogeneous water is investigated. The motion occurs in two principal layers, a divergent surface Ekman layer and a subsurface return flow. The restriction that the surface layer depth be always a small fraction of the total depth permits the retention of the surface layer solution developed in a previous paper by the author where bathymetry was not treated. The subsurface motion is affected by bathymetry, but the governing equations can he simplified for bottom topographies of slopes characteristic of continental slopes and shelves. The velocity and pressure fields are deduced by a combination of analytic and numerical means. The principal physical effects of bathymetry are two-fold. Shoaling uplifts and compresses the streamline field in the return flow. The resulting acceleration of the flow toward shore induces a jet in the longshore velocity field for the subsurface layer. This motion occurs in the direction of the longshore wind component and exceeds the surface layer longshore movement in mass flux.

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