Abstract View

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A Three-Dimensional Simulation of Coastal Upwelling off Oregon

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ABSTRACT

The wind driven, *x*-*y*-*t*, two-layer β-plane numerical model developed by Hurlburt (1974) is used to investigate the effects of a bottom topography and coastline configuration, like that off Oregon, on the onset and decay of the ocean upwelling circulation. The digitized nearshore Oregon bathymetry is analyzed for dominant scales, and a smoothed version is used in model cases with several different initial states and wind stresses. Cases with topography are compared to cases with plane sea beds. Topographic variations are found to dominate over coastline irregularities in determining the longshore distribution of upwelling. Results indicate that stronger upwelling observed near Cape Blanco is primarily due to the local bottom topography and not the cape itself. Observed variations in the meridional and zonal flow are attributed to the topographic β-effect. In particular, during spin-up with an equatorward wind stress, a nearshore poleward undercurrent is most likely to develop in regions where topographic beta is positive. Upper layer poleward flow is observed during spin-down. The existence of an onshore transport jet south of Cape Blanco is predicted. Zonal mass balance is *not* observed. Topographic Rossby waves are excited during spin-up. Baroclinic continental shelf waves are observed in time series of the pycnocline height contours.

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