Abstract View

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The Influence of Bottom Topography on Upwelling off Peru

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ABSTRACT

The *x-y-t*, two-layer β-plane numerical model developed by Hurlburt (1974) is used to examine the upwelling system off Peru. The region off Peru from 14 to 15°30's is one of strong and persistent upwelling. The most distinctive feature of the Peruvian upwelling circulation is a predominant poleward flow. A local area model, when forced by wind stress only, cannot account for the observed Peruvian circulation. When an additional barotropic forcing is applied in the model, a dominating poleward flow results. The effects of wind stress are felt on the upper layer and by the third day of integration an equatorward flow develops near the coast. Two functional representations of the actual topography are used in the model and compared to a flat-bottom case. Model results, when compared to observations, show that the observed upwelling maximum ~40 km south of 15°S is the result of a mesoscale topographic feature, a seamount. Variations of longshore and cross-shelf flow in cases with sloping topography are explained as a result of conservation of potential vorticity and conservation of mass transport over the seamount. Vertical cross sections of the model results show strong poleward flows with a narrow layer of equatorward flow near the coast. Vertical cross sections also reveal offshore flow in the upper 40 m below which a thicker onshore flow exists. As a result of the effects of rotation on the strong poleward flow, and the effect of a subgeo-strophic lower layer, a narrow bottom offshore layer appears over the shelf.