Abstract View

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On Coastal Jets and Upwelling in Bounded Basins

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ABSTRACT

The relationship between coastal upwelling and coastal long-short currents is studied in a simple model of a continuously stratified fluid in a closed basin on the *f*-plane. It is shown that the coastal long-shore current at any point on the basin's perimeter is determined primarily by the components of the long-shore stress with the *largest long-shore scales*, in particular from the perimeter average of the long-shore stress. In addition, the depth structure of the upwelling itself is shown to be dependent on the long-shore scale.

It is concluded that the relationship between upwelling and long-shore currents is non-local, that mass balance is not achieved locally in planes normal to the coast, and that the relationship between onshore flows and long-shore currents is scale-dependent. An intrinsic long-shore length scale is found separating two regimes of flow with distinctly different relations between the wind stress, onshore, and long-shore flows. Since both regimes are present simultaneously for a wind stress containing a variety of long-shore scales, the determination of the *long-shors structure* of the wind stress is essential to an understanding of the local oceanic upwelling and long-shore current structure.