## Abstract View

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# A Two-Dimensional Diabatic Isopycnal Model—Simulating the Coastal Upwelling Front

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ABSTRACT

A two-dimensional diabatic isopycnal model is designed to study coastal upwelling. The diabatic effect is represented by vertical mixing of the density field. Vertical eddy coefficients are determined by either a Richardson-number-dependent formula or a diagnostic second-order-moment closur turbulence model.

Some idealized coastal upwelling cases are studied. The results show that in a frontal zone. not only the density and velocity, but also the mixing intensity develop strong spatial variability. By using the turbulence model, sharp boundaries exist between the fully turbulent and quiescent regions. The thermal wind relation is greatly affected by turbulent mixing. Besides the effect of vertical diffusion of longshore momentum as suggested by one-dimensional models, vertical diffusion of density at a different rate horizontally has a strong effect on the thermal wind balance. Localized turbulent mixing will change the horizontal density gradient of its surrounding areas. As a result, strong upwelling develops in the region where turbulent intensity is maximum. During an upwelling event, turbulence first occurs at the inshore side of the surface front. Because of upwelling and downward diffusion of heat, the surface front is intensified at its offshore side. When the Richardson-number-dependent formula is used to calculate eddy coefficients, mixing occurs over a wider region; thus, no surface front develops.

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