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Transient Upwelling Generated by Two-Dimensional Atmospheric Forcing and Variability in the Coastline

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ABSTRACT

The present paper deals with two-dimensional transient upwelling in a two-layer ocean of constant depth. Motions generated by several two-dimensional atmospheric forcings are investigated. Using asymptotic expansions in time, it is shown that the component of the wind parallel to the coast generates an interface elevation which propagates along the coast as an internal Kelvin wave front. Strong horizontal baroclinic motions are linked to this phenomenon. The velocity within the deep layer is in the opposite direction to that of the wind on the surface. It is found that the spin-up time of mean motions is of the order of the Coriolis period.

The motion generated by a wind blowing over a bay is then studied. The bay is idealized by a right angle corner. Two independent cases are considered, depending on whether or not the wind is parallel to one coast or the other.

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