# Abstract View

Volume 1, Issue 2 (April 1971)

**Journal of Physical Oceanography**
Article: pp. 82–91 | Abstract | PDF (761K)

## A Numerical Investigation of Pressure-Induced Storm Surges Over the Continental Shelf

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(Manuscript received June 1, 1970, in final form December 14, 1970)

DOI: 10.1175/1520-0485(1971)001<0082:ANIOPI>2.0.CO;2

ABSTRACT

A nonlinear, two-layer model of pressure-induced surges at the ocean edge is developed. The bottom topography is taken to approximate the continental shelf and continental slope region. The Coriolis parameter is held constant, mixing between layers is assumed negligible, and friction is not explicitly included. An “infinite ocean” offshore boundary condition is approximated by a viscous absorbing region. Attention is confined to disturbances which are uniform along-shore but which allow along-shore flow.

The six dependent variables (two velocity components in each layer, the elevation of the free surface, and the interface between layers) are integrated using a modified Lax-Wendroff system. The characteristics of the numerical scheme are investigated both theoretically and in a series of numerical test cases.

The response of the system is forced by a moving pressure disturbance approximating the low pressure region of a uniform along-shore storm. Variations in storm speed, layer thickness and stratification are investigated. The results indicate: 1) as the storm moves across the coastline from land to sea there is an initial surge of water toward the coast followed by a forced wave moving seaward under the storm; 2) coupling between the velocity and the bottom topography through the Coriolis terms gives an along-shore flow that is concentrated in the region of the shelf break; 3) resonant-like behavior is found when the storm speed approaches the external free wave velocity over the shelf; and 4) in none of the cases were significant baroclinic currents generated in the forced surge, although slight deviations from a purely barotropic system were present.

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