Abstract View

Volume 14, Issue 6 (June 1984)

Journal of Physical Oceanography
Article: pp. 1013–1021 | Abstract | PDF (501K)

Circulation on the Continental Shelf of the Southeastern United States. Part II: Model Development and Application to Tidal Flow

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(Manuscript received July 29, 1983, in final form March 19, 1984)

DOI: 10.1175/1520-0485(1984)014<1013:COTCSO>2.0.CO;2

ABSTRACT

An extensive amount of work has been carried out to characterize the flow on the shelf between Cape Canaveral and Cape Hatteras. Data show that the winter flow in this region is driven mainly by tides and wind, while significant Gulf Stream effects are observed only on the outer shelf. A vertically integrated two-dimensional model is adapted to the South Atlantic Bight shelf and applied to predict tidal and wind-driven currents under vertically well-mixed conditions that are characteristic for the winter months (November to April).

The model is based on the equations of motion combined with the continuity equation and appropriate boundary conditions. A numerical finite element method in space is coupled with a simple finite difference scheme in time to integrate the equations. The model is predictive (prognostic) in that apart from boundary conditions only the bottom friction and the wind stress coefficient need be prescribed.

In the application of the model to tidal flow conditions, results of a 1° × 1° global model are used to prescribe the boundary conditions. Excellent agreement is found between predicted and measured flows on the shelf while at the shelf break, the data show considerable energy in the tidal frequency band which cannot be explained by this simple model.