Abstract View

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Forced Shelf Circulation by an Alongshore Wind Band

Shenn-Yu Chao

Oceanographic Center, Nova University, Dania, FL 33004

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ABSTRACT

The forced circulation over a continental shelf generated by the alongshore wind stress is studied within the frictional regime. The model alongshore wind stress has a finite extent in the alongshore direction and oscillates monochromatically, resembling a series of anticyclones traveling across the coast-line. Both the shelf-wave response and the localized non-wavelike response exist within the wind band. The numerical results show that the interaction of shelf waves with locally wind-forced response generates a large increase in the phase speed within the wind band. Given an alongshore variation in the alongshore wind stress, a right-bounded phase propagation is possible even in the absence of continental shelf waves. Given a reasonable friction currently accepted for the east coast of the United States, the resonance mechanism at the cutoff frequency may not be important, and lower frequency wind events generate larger amplitude continental shelf circulation. By reducing the friction, energy at cutoff frequencies leaks out of the wind band in both directions effectively. It also is shown that non-wavelike response depends only on the local wind stress and is not affected significantly by friction.