Abstract View

Volume 3, Issue 1 (January 1973)

Journal of Physical Oceanography
Article: pp. 33–46 | Abstract | PDF (968K)

Time-Dependent Coastal Upwelling

J. Dana Thompson and James S. O'Brien

Depts. of Meteorology and Oceanography, and the Geophysical Fluid Dynamics Institute, Florida Stage University, Tallahassee 32306

(Manuscript received December 24, 1971, in final form July 31, 1972)

DOI: 10.1175/1520-0485(1973)003<0033:TDCU>2.0.CO;2

ABSTRACT

Linear and nonlinear two-layer ocean circulation models of coastal upwelling on an *f*-plane are driven by time-dependent winds and solved numerically. Longshore variations in the circulation are neglected and offshore variations in the winds are specified. A technique for generating a realistic broad frequency-band wind stress from a kinetic energy spectrum of wind speed is developed.

When results from the two models are compared, nonlinearities are found to be unimportant in explaining the basic upwelling dynamics. However, they do provide a mechanism for wave-wave interactions which broaden all spectral peaks. In the nonlinear model coherence-squared spectra between the winds and zonal current components in the upwelling zone indicate highest coherence at lowest frequencies for both layers, accompanied by a 180° phase shift from upper to lower layer at frequencies <3 cycles per day. Similar analyses for winds vs meridional current components and winds vs pycnocline height anomalies show a coherence squared maximum for winds of 5-day period. In the frequency band below and including the inertial, remarkable similarities are observed between the results of the nonlinear model and actual ocean current autospectra.

top

Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718
Allen Press, Inc. assists in the online publication of *AMS* journals.