Abstract View

Volume 16, Issue 7 (July 1986)

Journal of Physical Oceanography
Article: pp. 1165–1178 | Abstract | PDF (1.02M)

Surf Zone Longshore Currents and Random Waves: Field Data and Models

Edward B. Thornton

Oceanography Department, Naval Postgraduate School, Monterey, CA 93944.

R.T. Guza

Center for Coastal Studies, Scripps Institution of Oceanography, University of California, La Jolla, CA 92037

(Manuscript received February 25, 1985, in final form December 18, 1985)

DOI: 10.1175/1520-0485(1986)016<1165:SZLCAR>2.0.CO;2

ABSTRACT

Analytic and numerical models for longshore currents generated by obliquely incident random waves am compared with field observations. Five days of observations were selected during which the waves were narrow banded in both frequency and direction, in keeping with model assumptions. The extensive measurements included radiation stress and wave directional spectra in 9 m depth, and a closely spaced array of current and pressure sensors on a line perpendicular to shore. The longshore current models are based on balancing the gradient of the radiation stress with the alongshore bed shear and Reynold's stresses, assuming stationary wave conditions and straight and parallel bottom contours. The spatial variation of wave height, required to determine the gradient of the radiation stress, is modeled using linear random wave theory. Given H_{rms} in 9 m depth, the model predicts H_{rms} at shoreward locations with an average error of less than 9%. Using a nonlinear bottom shear stress formulation and the measured topography, a bed shear stress coefficient of c_f = 0.006 gives optimal agreement between observed and predicted longshore currents. Eddy viscosity was found not to be important, at least for the nearly planar topography present during the observations.