Abstract View

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Radiation Stress Estimators

S.S. Pawka, D.L. Inman, and R.T. Guza

Shore Processes Laboratory, Scripps Institution of Oceanography, University of California, La Jolla, CA 92093

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ABSTRACT

The radiation stresses S_{ij} associated with the propagation of wind-generated waves are principal driving forces for several important surf-zone processes. The accurate estimation of the onshore flux of longshore-directed mean momentum S_{yx}, using a linear array of pressure sensors, is considered here. Three analysis methods are examined: integration of two high-resolution directional-spectrum estimators [maximum likelihood (MLM) and a modified version (IMLM)], and a direct estimator of the S_{yx} directional moment (DMM$_v$) which is developed here.

The S_{yx} estimation methods are compared using numerical simulations and field data from two experiments at Torrey Pines Beach, California. In the first field experiment, IMLM and DMM, estimates of S_{yx} (from a 3-element, 99 m long linear array) showed excellent agreement with a slope array (Higgins *et al.*, 1981) in the frequency range 0.05–0.15 Hz. In the second experiment, IMLM and DMM, estimates of S_{yx} (from a 5-element, 360 m long array) agreed with values of S_{yx} obtained from a nearby orthogonal-axis current meter for the frequency range 0.06–0.11 Hz. The integration of the MLM directional spectrum estimates yields biased (low) values of S_{yx}. Although the DMM method is used here for the estimation of S_{yx}, it can easily be adapted for the calculation of any arbitrary directional moment. While conventional methods are shown to be deficient in S_{yx} estimation, they provide accurate estimates of S_{xx}, the onshore flux of onshore-directed momentum.

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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
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