Abstract View

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Edge Waves in the Presence of an Irregular Coastline

J.D. Fuller and L.A. Mysak

Department of Mathematics, The University of British Columbia, Vancouver, B.C., Canada V6T 1W5

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ABSTRACT

We examine the generation of trapped edge waves on a continental shelf when a long wave from the deep ocean reaches an irregular coast, and alterations in the propagation characteristics of trapped edge waves due to the coastal irregularities. The continental shelf is modeled by a single flat-step model, and the coast is straight except for irregularities represented as a centered stationary random function of distance along the coast. The relevant boundary value problem are thus stochastic, with the randomness introduced through the boundary condition at the coast. We find the power flux into trapped edge waves and into a continuous spectrum of leaky modes, both generated by the scattering of an incident wave from the deep ocean. Numerical results, assuming a Gaussian spectrum for coastal irregularities, indicate that there is less power transferred to the forward traveling trapped wave than the backward one, and less power to the scattered leaky modes than to either the forward or backward traveling trapped modes. We obtain the attenuation coefficient of a trapped edge wave, the “tilting” of the wave toward the coast, and the correction to the dispersion relation due to the coastal irregularities. The results are valid for wave periods much shorter than the period associated with the Coriolis parameter f and for wavelengths much greater than the average size of the coastal irregularities.