

# Department of Ocean & Resources Engineering

*Seminar*

## LINEAR REFRACTION-DIFFRACTION MODEL FOR STEEP BATHYMETRY

by

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### **Abstract**

This describes the mathematical formulation, the numerical solution, and the validation of a linear refraction-diffraction model for steep bathymetry. Although the present approach is based on depth-integration of assumed flow characteristics, it correctly accounts for the vertical component of the seabed fluid velocity, which is not negligible when the seabed slope is large. The model involves two governing equations derived respectively from the exact seabed boundary condition and the Laplace equation, and reduces to the extended and the original mild-slope model when the seabed slope is small. The mathematical problem is not self-adjoint, and therefore, the weighted residual approach is used to derive the finite element equations from the hybrid element method. The capability of the present model to simulate wave transformation over three-dimensional bedform is examined in a parametric study and the computed results are verified with those of a three-dimensional wave model. The present model is shown to provide more accurate predictions of the wave amplitude and the water particle kinematics in comparison to other linear depth-integrated models.