# Long waves over random topography

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**Abstract:**

In this talk, we present a Hamiltonian formulation for water waves over a variable bottom based on potential flow theory. The problem is reduced to a lower-dimensional system involving boundary variables alone. This is accomplished by introducing the Dirichlet–Neumann operator which expresses the normal fluid velocity at the free surface in terms of the velocity potential there, and in terms of the surface and bottom variations. A Taylor series expansion of the Dirichlet–Neumann operator in homogeneous powers of the surface and bottom variations is proposed [2]. This formulation has implications for the convenience of asymptotic calculations and direct numerical simulations of the Euler equations for water waves. We derive asymptotic models for long waves over a random bottom topography [1,3], and develop an efficient and accurate numerical method based on the fast Fourier transform to solve the Euler equations [4]. Numerical applications will be presented.
This is joint work with A. de Bouard, W. Craig, O. Diaz-Espinosa, D. P. Nicholls and C. Sulem.

**References:**

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