



## **Coastal Zone Dynamics in 2+1 Dimensions: Theory and Hyperfast Modeling**

A. Osborne

Nonlinear Waves Research, Arlington, VA, USA (al.osborne@gmail.com)

I discuss the dynamics of coastal zone ocean waves using as a basis the 2+1 Boussinesq equations. I construct the solutions of Boussinesq based upon the method of algebraic geometry. Of particular importance in this formulation is the inclusion of spatially variable coefficients that simulate the effects of variable bathymetry. I show how to construct the Riemann surface of the associated nonisospectral problem, including the spatially variable bathymetric features, and the associated quasi-periodic Fourier series with incommensurable frequencies. This solution of the Boussinesq equations can be employed to develop a numerical model for the coast zone. There are several advantages of the model: (1) the physics of solitary waves and their interactions are explicitly included, (2) the computations are perfectly parallel so that a computer with  $N$  cores will give a speed-up of  $N$  times and (3) the model may be adapted to the full three dimensional analysis of measured ocean wave data, including data from single probes, arrays or the remotely sensed sea surface.