A BOUSSINESQ SCALING APPROACH TO SOLVING NEAR SHORE PHASE RESOLVING NONLINEAR WAVES

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Near shore wave dynamics pose a number of analytic and numerical challenges. For numeric modelling one challenge is the balance between solution accuracy and computational cost. Boussinesq-type scaling offers one solution to this challenge, however the assumption of irrotationality in the solution sacrifices many of the near-shore physics that are generated. Here we focus on an approach for resolving the near-shore physics through a scaled approximate solution to the Pressure Poisson equation. A Boussinesq-type scaling is employed but without the assumption of irrotationality in the system. Results have shown highly accurate solutions to a variety of problems.
One approach to resolving near-shore wave dynamics is to examine solutions to the Pressure Poisson equation. A Boussinesq type scaling of the governing equations is employed as well as a Green-Nagdhi expansion for the vertical axis. Analytic and numeric solutions will be discussed. In particular it will be shown that in the two-dimensional linear case the solution shows excellent convergence properties to the known Airy solution. For the nonlinear case analytic results will be compared to results from a discontinuous Galerkin finite element code developed for this project.
Another approach to resolving wave dynamics in the surf zone is to focus solving the Navier-Stokes equations coupled with the continuity equation. It will be shown that for the linear two dimensional case both of these approaches provide identical results. For the nonlinear case there will be discussion comparing the results of discontinuous Galerkin finite element codes for each approach.