Mathematical models for nonlinear gravity-capillary waves.

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Abstract:

Nonlinear waves propagating at the surface of an incompressible and inviscid fluid are considered. The flow is assumed to be irrotational. The effects of gravity and surface tension are included in the dynamic boundary conditions. The fully nonlinear problem is solved by boundary integral equation methods. In addition various weakly nonlinear models are discussed. In two-dimensions there are multiple periodic solutions, generalized solitary waves and solitary waves with decaying oscillatory tails. The connections between these various types of waves are discussed. In three dimensions it is found that there are solitary waves with decaying oscillations in the direction of the propagation and monotonic decay in the direction perpendicular to the direction of propagation. Very recent results on the dynamics of two-dimensional solitary waves are also discussed.