The Generalized Serre Equations for Shallow Water Waves

Paul Milewski
Department of Mathematics, University of Wisconsin, Madison, WI, USA
Tel: 1-608-262-3220, email: milewski@math.wisc.edu

Abstract:

The Serre equations were first written in 1953 and govern fully nonlinear weakly dispersive shallow water waves. They have been studied much less than their weakly nonlinear counterparts the Boussinesq equations, despite having better properties: Gallilean invariance, simple energy and momentum expressions and explicit solitary waves. (In fact the Serre equations have been independently rederived several times and are sometimes called the Su-Gardner system or the Green-Naghdi equations.) We shall discuss several aspects of these equations: (i) the inclusion of surface tension effects, (ii) the one-parameter family of equations resulting from expanding the solutions about an arbitrary depth in the fluid, (iii) a consistent fully “time-explicit” version of the equations and (iv) a symmetric splitting based on the non-dispersive Riemann invariants of the system.

References: