

Nonlinear Partial Differential Equations

Boundary value problems and equations arising in fluid mechanics

The short pulse equation by a Riemann-Hilbert problem
approach

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We consider the adaptation of the inverse scattering transform method, in the form of a Riemann-Hilbert factorization problem, to the study of initial and initial-boundary value problems for the short-pulse equation (SPE) $u_{xt} = u + (u^3)_{xx}$. The SPE can be viewed as a short-wave limit of the modified Camassa-Holm equation $m_t + ((u^2 - u_x^2)m)_x + \gamma u_x = 0$, $m = u - u_{xx}$. On the other hand, it is a reduced version of the Ostrovsky equation, which models small-amplitude long waves in rotating fluids of finite depth.