
Numerical investigations on the stability of periodic waves

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Abstract

This work is concerned with the stability theory of periodic traveling waves in some one-dimensional dispersive Hamiltonian PDEs pertaining to a general framework that contains well known cases like the generalized Korteweg-de Vries equation (gKdV) or the Euler-Korteweg system (EK). We focus on co-periodic stability, that is, stability with respect to perturbations with the same period as the wave.

We have obtained stability criteria in terms of an abbreviated action integral, which is a function of the wave's parameters. For periodic waves, this action integral plays the role of the celebrated Boussinesq moment of instability for solitary waves. Our stability criteria depend on the negative signature of the Hessian of the action. By comparison, stability criteria for the solitary waves only involve the second derivative of the Boussinesq moment of instability with respect to the speed of the solitary wave.

We will show how to compute the required Hessian matrices, and present some numerical investigations of those stability criteria for several PDEs including (gKdV) cases, as well as the generalized Boussinesq equation. This is a joint work with S. Benzoni-Gavage et L.M. Rodrigues.

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