

Existence and stability of solitary water waves with surface tension

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Solitary water waves with surface tension on water of infinite depth are constructed by minimising the energy subject to the constraint of fixed momentum. The stability of the set of minimisers follows by a standard principle since the energy and momentum are conserved quantities. The stability must however be understood in a qualified sense due to the lack of a global well-posedness theory for the initial value problem. The variational method relies on the concentration-compactness principle and a penalisation argument, which is needed because of the quasilinear structure. To leading order the solitary waves take the form of a periodic wave train modulated by a small-amplitude decaying envelope described by the focusing nonlinear Schrödinger equation.