

Standing Gravity Waves in Deep Water

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We consider the two-dimensional potential flow of *standing gravity waves on an infinitely deep water, with no surface tension at the free surface*. Linear theory gives *infinitely many eigenmodes for any rational value of the dimensionless parameter $\mu = gT^2/2\pi\lambda$* (T and λ being time and space periods). We use a formulation of Dyachenko *et al* leading to a nonlocal second order partial differential equation, for which the existence of infinitely many approximate solutions at any order is known. For proving the existence of solutions with a given asymptotic expansion, we use an appropriate version of the Nash-Moser implicit function theorem, where the major difficulty is to invert the linearized operator near a non zero point. We can show the *existence of standing waves for an infinite sequence of values of μ tending to any rational number*.

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