

Asymmetrical three-dimensional gravity waves on Beltrami flows

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Abstract

We prove the existence of small amplitude three-dimensional doubly periodic steady gravity water waves with vorticity. The domain of the fluid has finite depth, and the pattern of the waves is non-symmetric with respect to the direction of propagation; moreover, the relative velocity field is a Beltrami field, meaning that the vorticity is proportional to the velocity. This is the first existence result of three-dimensional periodic gravity waves with nonzero vorticity. The main difficulties arise from the presence of vorticity, which in turn leads to a careful study of a generalized Dirichlet-Neumann operator, and from the absence of surface tension, which leads to small-divisors issues.

This is a joint work with D. Nilsson (Universität des Saarlandes) and E. Wahlén (Lunds Universitet).