

Analytical methods for computing rotational water waves

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Abstract:

In this talk we consider the classical water wave problem described by the Euler equations with a free surface under the influence of gravity over a flat bottom. We restrict our attention to two-dimensional, finite-depth periodic water waves with general vorticity and we formulate a free boundary problem with the presence of a parameter in the boundary conditions. This parameter is the so-called Bernoulli's constant which represents the total mechanical energy on the free boundary and here is treated as a bifurcation parameter. This work is triggered by a penalization method for computing large amplitude water waves.

Emphasizing on large amplitude water waves, both qualitative and quantitative results, which characterize these waves, are presented, depending on physical parameters, such as the vorticity, the relative mass flux and the total mechanical energy.

This is joint work with A. Constantin and O. Scherzer.