

Some unsolved problems in the formulation of the theory of water waves.

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Abstract

In water wave theory, it is usual to seek both local solutions and conservation relations so that the solution may be obtained globally. This is achievable for irrotational motions but much more difficult when vorticity is present. The talk will begin by describing why the irrotational case is not insurmountable and then describe possible extensions to the rotational case, including both the pressure-streamfunction formulation and Clebsch potentials; this will be done via a Lagrangian formulation. These issues will be addressed via the consideration of a wave-current interaction in two dimensions, where the current possesses an arbitrary distribution of vorticity and waves are restricted to the linear regime.