Mathematical Physics

Elliptic and hyperelliptic functions describing the particle motion beneath small-amplitude water waves with constant vorticity

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We provide analytic solutions of the nonlinear differential equation system describing the particle paths below small-amplitude periodic gravity waves travelling on a constant vorticity current. We show that these paths are not closed curves. Some solutions can be expressed in terms of Jacobi elliptic functions, others in terms of hyperelliptic functions. We obtain new kinds of particle paths. We make some remarks on the stagnation points which could appear in the fluid due to the vorticity.

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