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Nonlinear water waves generated by impulsive motion of submerged obstacle

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The fully nonlinear problem on generation of unsteady water waves by impulsively moving obstacle is studied analytically. The method involves the reduction of basic Euler equations to the integral-differential system for the wave elevation together with normal and tangential fluid velocities at the free surface. Exact model equations are derived in explicit form when the isolated obstacle is presented by totally submerged circular- or elliptic cylinder. Small-time asymptotic solution is constructed for the cylinder which starts moving with constant acceleration from rest. It is demonstrated that the leading-order solution terms describe several wave regimes such as the formation of non-stationary splash jets by vertical rising or vertical submersion of the obstacle, as well as the generation of diverging waves by horizontal- and combined motion of the obstacle under free surface.

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