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Weakly nonlinear evolution of a cavity on a free-surface[1]
SASWATA BASAK, RATUL DASGUPTA, Indian Institute of Technology Bombay — We formulate a second order asymptotic solution in two dimensional Cartesian coordinates to the initial value problem involving a finite-amplitude, localized perturbation resembling a cavity (Gaussian depression) on the free-surface of a horizontally unbounded, infinitely deep liquid. We employ the Hamiltonian theory for inviscid capillary-gravity waves and expand upto the three-wave interaction Hamiltonian. The Zakharov equation [Zakharov (1968), *J. Appl. Mech. Tech. Phys., 9(2)*] is numerically solved for the aforementioned Cauchy data on the canonical coordinates in our reduced Hamilton's equation [Krasitskii (1994), *JFM, 272*]. We compare the time evolution of our weakly nonlinear interfacial profile with the corresponding linear solution to the classical Cauchy-Poisson problem [Poisson (1818) : *Mem. Prs. divers Savants Acad. R. Sci. Inst. 2*; Cauchy (1827) : *Mem. Prs. divers Savants Acad. R. Sci. Inst. 1*] and results obtained from Direct Numerical Simulation (DNS) of the Euler's equation (including both gravity and surface tension) using Basilisk [basilisk.fr].

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