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Jetting in large amplitude axisymmetric capillary gravity waves[1]
RATUL DASGUPTA, SASWATA BASAK, PALAS KUMAR FARSOIYA, Indian Institute of Technology Bombay — The phenomenon of jetting and accompanying droplet ejection is known to occur in many fluid dynamical situations involving collapse of a gaseous cavity at a liquid-gas interface. In a recent study of free, capillary-gravity oscillations on a quiescent cylindrical pool of liquid [Farsoiya et.al J. Fluid Mech., 857, pp. 80-110 (2017)], it has been shown using DNS that jetting may be obtained with an initial interfacial perturbation in the form of a single Bessel mode. Sufficiently large values of wave steepness lead to the formation of a jet at the axis of symmetry that can eject droplets from its tip. In this study, we formulate the solution to the weakly nonlinear, inviscid-irrotational, initial-value problem in axisymmetric cylindrical coordinates using wave steepness as a small parameter and obtain a third order solution for the free surface profile. It is seen that the weakly nonlinear solution is able to describe the onset of jet formation. A detailed discussion of capillary effects along with comparisions with Direct Numerical Simulations, will be presented.

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