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On the velocity field of the jets emerged from collapsing cavities[1]

FRANCISCO J. BLANCO-RODRIGUEZ, JOSE M. GORDILLO, Universidad de Sevilla — A recent research work (Gordillo & Rodríguez-Rodríguez, J. Fluid Mech., (2019)) had been demonstrated undoubtedly that the capillary waves was the responsible of the ejection of bubble bursting jets and that the velocity field at the ejection time can be approached using a line of sinks whose length ℓ_s is proportional to the wavelength $\lambda^*(Oh)$ of the capillary wave which is not attenuated by viscosity being $Oh = \mu/(\sqrt{\rho\, R\, \sigma})$ the Ohnesorge number. Here, comparing that theoretical framework with the numerical results computed by `GERRIS`, we provide an unified description of different physical scenarios in which liquid jets are expelled out of the bulk of a liquid as a consequence of the capillary collapse of an initially rounded cavity which is transformed into a truncated cone with an opening semiangle β. It is demonstrated here that the potential-flow velocity field created by a line of sinks with intensities fixed by the capillary velocities induced at the base of the conical cavity from which the jet is issued, is in remarkable agreement with those obtained from the numerical solution of the jets observed when either a bubble bursts at a free surface or when the cavity formed when a drop falls on a liquid pool, collapses.

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