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Small-amplitude oscillations of a drop pinned at an azimuth DORAISWAMI RAMKRISHNA, SANTHOSH RAMALINGAM, OSMAN BASARAN, Purdue University, West Lafayette — Natural modes of oscillation of an inviscid drop undergoing irrotational flow and constrained by a ring of negligible thickness at an azimuthal angle with respect to the center of the droplet are studied analytically and numerically. Similar to linear oscillations of a free drop first studied by Rayleigh, the analytical formulation of the oscillations of the constrained drop results in an eigenvalue problem but with one additional boundary condition, i.e. that accounting for zero perturbation along the contact point. A minimization method that converts the eigenvalue problem into a constrained optimization problem is used to solve for the eigenvalues of various modes of oscillation and the corresponding mode shapes. An extension of Green's function method used to analyze oscillations of a drop in contact with a spherical bowl [M. Strani and F. Sabetta, *J. Fluid Mech.* **141**, 233 (1984)] is also employed to study the problem at hand. Results obtained from these two approaches are compared to those reported by Bostwick and Steen [*Phys. Fluids* **21**, 032108 (2009)] and ones obtained from new simulations using the Galerkin/finite element method.

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