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Axisymmetric contour dynamics for buoyant vortex rings CHING CHANG, STEFAN LLEWELLYN SMITH, University of California, San Diego — Vortex rings are important in many fluid flows in engineering and environmental applications. A family of steady propagating vortex rings including thin-core rings and Hills spherical vortex was obtained by Norbury (1973). However, the dynamics of vortex rings in the presence of buoyancy has not been investigated yet in detail. When the core of a ring is thin, we may formulate reduced equations using momentum balance for vortex filaments, but that is not the case for fat rings. In our study, we use contour dynamics to study the time evolution of axisymmetric vortex rings when the density of the fluid inside the ring differs from that of the ambient. Axisymmetry leads to an almost-conserved material variable when the Boussinesq approximation is made. A set of integro-differential equations is solved numerically for these buoyant vortex rings. The same physical settings are also used to run a DNS code and compare to the results from contour dynamics.

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