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Dynamics of a surface tension driven vortex ring[1] ANURAG PANT, BABURAJ A PUTHENVEETTIL, Indian Inst of Tech-Madras — When an ethanol droplet is deposited on water surface, the surface tension difference between the ethanol and the water ($\Delta\sigma$) spreads a part of the drop as a thin film on the water surface. A buoyant vortex ring is found to expand beneath the spreading film such that the vortex ring radius (R), varies with time as $t^{1/4}$, similar to the film radius(r_f). We study the generation and expansion of this buoyant vortex ring below the surface of a deep water layer. We propose a scaling for the vorticity generation at the interface, which we verify using 2-D PIV velocity measurements. The proposed scaling needs the presence of a small length scale, proportional to r_f, across which $\Delta\sigma$ occurs. We explore the possible presence of such a length scale in the peripheral instability of the spreading film. This flower shaped instability is seen to occur when the Weber number based on r_f becomes order one. The observed wavelengths and amplitudes of the instability are studied and compared with Rayleigh-Taylor instability as well as Vortex instability.

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