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Buoyancy and surface tension driven convection around a bubble

[Savino, R.](#); [Fico, S.](#)

Physics of Fluids, Volume 18, Issue 5, pp. 057104-057104-14 (2006).

A combined experimental and numerical analysis has been carried out to study the behavior of a bubble under a horizontal heated surface. In this configuration, the interaction between buoyancy and surface tension driven convection produces complex fluid dynamic structures. An instability occurs in the form of an oscillatory three-dimensional fluctuation of the thermal and velocity field when a critical temperature difference is exceeded. The structure of this flow regime has been investigated with transient three-dimensional simulations carried out for normal gravity and zero gravity conditions. The velocity field around the bubble has been experimentally analyzed with a "laser sheet" technique for the flow visualization and a Wollaston prism interferometer has been utilized to capture the oscillatory temperature field. Good correlations are shown between experimental and numerical results.

Keywords: Thermal convection, Buoyancy-driven instabilities, Surface-tension-driven instability, Interactions with surfaces, Morphological instability; phase changes, Computational methods in fluid dynamics

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