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Inclusion of buoyancy effects in the evaporating liquid film evolution equation ANEET NARENDRANATH, Michigan Technological University, JERAMY KIMBALL, JAMES HERMANSON, University of Washington, ROBERT KOLKKA, JEFFREY ALLEN, Michigan Technological University — Macroscopic liquid films are entities that are important in biophysics, physics, and engineering, as well as in natural settings. They can be composed of common liquids such as water or oil, rheologically complex materials such as polymers solutions or melts, or complex mixtures of phases or components. When the films are subjected to the action of various mechanical, thermal, or structural factors, they display interesting dynamic phenomena such as wave propagation, wave steepening, and development of chaotic responses. Such films can display rupture phenomena creating holes, spreading of fronts, and the development of fingers. Researchers have conducted stability analysis on evaporating liquid films and have developed an evolution equation describing the effect of various physical mechanisms that affect evaporating liquid films. The present work extends the evolution equation proposed in literature by including the effect of buoyancy through the Boussinesq approximation. The extended evolution equation allows for capturing buoyancy effects inherent in evaporating thick liquid films.

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