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Stretching and Rupture of Suspension Bridges, of the Fluid Variety KEVIN CONNINGTON, The Levich Institute, The City College of New York, MARK MISKIN, The University of Chicago, TAEHUN LEE, Mechanical Engineering, The City College of New York, MARK SHATTUCK, JEFFREY MORRIS, The Levich Institute, The City College of New York, HEINRICH JAEGER, The University of Chicago — A "suspension bridge" is similar to a liquid bridge but contains solid particles suspended in the liquid. In this work, experiments and numerical simulations are performed to examine the dynamics of the stretching of a suspension bridge, and the eventual rupture. The experiments are performed using a suspension density matched with the surrounding immiscible liquid to minimize gravitational effects; the simulations are performed using a multi-component lattice-Boltzmann(LB) method coupled with an established method for LB simulation of suspended solids. The focus is on particle rearrangements and rupture dynamics, as well as the force required to stretch the bridge, with comparisons made between the case of a suspension bridge and simple liquid bridge. It is found that even under dilute particle loading, the rupture dynamics are significantly altered by the influence of particles. Under concentrated conditions, the rearrangements of the particles are associated with significant distortion of the interface, and a simpler simulation tool which balances particle interactions with the capillary forces from the boundary appears to capture salient features of the dynamics. The ultimate rupture dynamics are compared to the pinch-off behavior in drop formation from suspensions.

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