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Numerical simulations of relaxation and breakup of an elongated droplet JING LOU, SHAOPING QUAN — The relaxation and breakup of an initially elongated droplet in a viscous fluid is studied using a moving mesh interface tracking (MMIT) / finite volume method. The interface is zero thickness and moves with the fluid. Mesh adaptations are employed to allow large deformation and to capture the changing curvature, and mesh separation is implemented to permit pinch-off. Detailed investigations of the relaxation and breakup process are performed. It is found that the vortex rings play an important role in the relaxation and pinch-off process, and they are created and collapsed during the process. It is shown that the fluid velocity field and the neck shape are distinctly different for viscosity ratios larger and smaller than $\mathcal{O}(1)$, and thus a different end-pinching mechanism is observed for each regime. The length ratio also significantly influences the velocity distributions, but not the neck shape. The effects of the density ratio on the relaxation and breakup process are minimal. However, the droplet evolution is retarded. The formation of a satellite droplet is observed, and the size of the droplet depends strongly on the length ratio and the viscosity ratio.

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