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Numerical studies of the deformation of an initially rotating droplet ERIC POON, ANDREW OOI, University of Melbourne, SHAOPING QUAN, JING LOU, Institute of High Performance Computing, MATTEO GIACOBELLO, Defence Science and Technology Organisation — An initially rotating droplet subjected to an impulsive acceleration by the uniform free stream is studied numerically using the moving mesh interface tracking method (Quan, *et. al.*, J. Comp. Phys, **221**, 2007) at Re_i=40, We_i=40, η=λ=50. The rotation axis is aligned in the transverse direction and the dimensionless rotation rate, Ω^*, from 0–1 is considered. For $\Omega^* \leq$0.2, the droplet deforms in a similar fashion to the stationary droplet except the droplet is tilted. At higher Ω^*, the centrifugal force acting on the droplet increases and the droplet is spun radially away from the rotation axis. As a result, the surface area normal to the free stream decreases and this leads to a significant reduction in drag coefficient. The droplet deformation also has a substantial effect on the lift coefficient. As the droplet deforms, the kinetic energy of the rotation is mainly transferred to the surface energy on the interface, which results in a decline in lift coefficient after the initial jump as the surrounding flow field becomes symmetric again.

Eric Poon
University of Melbourne

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