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Mechanism of the lift force acting on a levitating drop over a moving surface[1] MASAFUMI SAITO, YOSHIYUKI TAGAWA, MASAHARU KAMEDA, Tokyo Univ of Agri & Tech — The purpose of this study is to understand the levitation mechanism of a drop over a moving surface. In our experiment we softly deposit a silicon-oil drop onto the inner wall of a rotating hollow cylinder. With sufficiently large velocity of the wall, the drop steadily levitates. The drop reaches a stable angular position in the cylinder, where the drag and lift balance the weight of the drop. The lift force, which is vital for the levitation, is generated inside a thin air film existing between the drop and the wall. Here three-dimensional shape of the air film plays a crucial role for the magnitude of the lift force. Note that, although the shapes of some levitating drops had been reported, the lift estimated from the shape had not been validated. Using interferometric technique, we measure the three-dimensional shape of the air film under the drop. We then calculate the lift by applying the lubrication theory. This lift is compared with that estimated from the angular position. Both lifts show a fair agreement. In addition, we investigate the shapes of the air film under drops with various sizes, viscosities and wall velocities. We discuss effects of these parameters on the shape and the lift.

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