Evaporation of water with an extremely small contact angle on a solid substrate: from a puddle to a small droplet

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Evaporation is a common phenomenon in everyday life. However, most previous studies have focused on the evaporation of a small sessile drop, and a systematic approach to the evaporation rate of a large drop is insufficient. Previous studies noted that when a small droplet evaporates, diffusion dominates and the evaporation rate is proportional to the radius of the droplet. On the contrary, for the large drop evaporation, convection dominates and the evaporation rate is proportional to the square of the radius of the drop. In this paper, the profile of a water drop on a solid substrate, changing from a puddle to a small droplet is calculated by solving the Young-Laplace equation and related ODEs through Mathematica. We provide the water drop evaporation experiment data done on a scale to track the evaporation and compare the calculated data with the experimental data. In conclusion, for the evaporation of a puddle with an extremely small contact angle, the evaporation rate is proportional to the radius of the drop not to the square of the radius of the drop because of its shape.