FM8S_11614

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Spreading and Retraction of Impacting Drops

Christophe Josserand, Stephane Zaleski

Laboratoire de Modélisation en Mécanique CNRS-Université P. & M. Curie, Paris, France

We consider theoretically and numerically the axisymmetric dynamics of drop impacts on a hydrophobic solid surface. For reasonable Weber and Reynolds numbers the dynamics shows an initial spreading of the drop on the substrate followed by a retraction phase due to capillary forces. We perform a parametric study to investigate both capillary and viscosity influences on this dynamics. We particularly focus on the film thickness during the spreading. At early times of impact the ejected liquid lamella is determined for low Weber number by the capillary length. On the contrary for large Weber numbers we observe that the residual liquid film in the center of the impact at maximum spreading is controlled by viscous effects. The retraction dynamics is also captured and is clearly dependant on the liquid film thickness at the center. A simple Taylor-Cullick theory for receeding liquid film on solid substrate will be derived and compare to the numerical results for this hydrophobic case. More general situations with non trivial contact angle will be discussed.

View the extended summary