

Drop Impact Readme

Description:

This dataset contains total internal reflection microscopy (TIRM) videos capturing the failure mode of an air film during drop impact. TIRM, with single-nanometer height resolution, is used to measure the interstitial air film beneath an aqueous droplet impacting a lubricated surface. Two high-speed cameras were used: one to capture TIRM images of the interstitial air film and the other to record synchronized side-view images. The TIRM images were captured at a pixel resolution of $13\text{ }\mu\text{m}$ and a frame rate of 50,000 frames per second, corresponding to a temporal resolution of $20\text{ }\mu\text{s}$.

The drop viscosity was varied to study its influence on the dimple contact mode. In the experiments, three liquid viscosities (1, 3, and 10 cP) were examined while keeping approximately the same Weber number ($We = 3.6\text{--}3.7$). The dataset includes nine video files visualizing drop impact dynamics. Videos v1, v2, and v3 are the TIRM image sequences of the interstitial air film underneath an aqueous drop of viscosity 1, 3 and 10 cP impacting a surface. Videos v4, v5, and v6 are the corresponding side-view recordings. Videos v7, v8, and v9 are 3D renderings of the air film reconstructed from TIRM images.

Data structure:

The video files can be read as follows:

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[v1] mul_1cP_We_3p6_TIRM.gif [1]
[v2] mul_3cP_We_3p6_TIRM.gif [1]
[v3] mul_10cP_We_3p7_TIRM.gif [1]
[v4] mul_1cP_We_3p6_sideview.gif [1]
[v5] mul_3cP_We_3p6_sideview.gif [1]
[v6] mul_10cP_We_3p7_sideview.gif [1]
[v7] mul_1cP_We_3p6_airfilm.gif [1]
[v8] mul_3cP_We_3p6_airfilm.gif [1]
[v9] mul_10cP_We_3p7_airfilm.gif [1]
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mul: Viscosity, We: Weber number, cP: CentiPoise

Reference:

[1] Zhang, L., Soori, T., Rokoni, A., Kaminski, A. and Sun, Y., 2021. Thin film instability driven dimple mode of air film failure during drop impact on smooth surfaces. *Physical Review Fluids*, 6(4), p.044002.