Cavity collapse and jet generation during the droplet impact

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Free surface of a droplet impacting on a surface deforms significantly within a timescale of milliseconds. This large deformation leads various phenomena such as spreading, splashing, etc. It is well known that which phenomenon will be occurred is determined by the impact velocity, liquid viscosity, atmospheric pressure, surface tension, and the surface characteristics. For instance, the droplet behaviour is completely different when a droplet is dropped on a hydrophilic surface and when it is dropped on a superhydrophobic surface. On superhydrophobic surfaces, the droplet bounces off the surface like a rubber ball at low Weber number (which indicates a significance of inertia over surface tension), whereas the droplet spreads and sticks on hydrophilic surfaces at the same impact condition. The bounce motion on superhydrophobic surfaces can be explained by low adhesive force of the wall surface and surface tension that exerts on liquid interface to make it have less surface area. However, if we increase the impact velocity, we can observe interesting phenomenon: jetting. The jet, specifically the Worthington jet, is generated because of a collapse of an air cavity formed at the centre of the droplet. Furthermore, we found that the jet velocity and the characteristic radius depends on the impact velocity, which results from oscillations of the droplet cap caused by the impact.

Speaker Biography

Ken Yamamoto has completed his PhD at the age of 29 years from Tokyo Metropolitan University, Japan. He is an assistant professor of Tokyo University of Science, Japan. He has over 10 publications that have been cited over 80 times.

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