Touchdown Events during Drop Impact of Newtonian Fluid

Frim, Michael (School: Evanston Township High School)

When small drops of Newtonian fluid splash onto solid surfaces, small circular and semicircular touchdown events, dubbed “trickle” events, appear near the edge of the splash when viewed from the bottom of the splash. While they have been observed in the past, trickle events have not been wholly studied. The purpose of this experiment was to attain a better understanding of how trickle events relate to the viscosity and impact velocity of the drop. Utilizing a drop impact apparatus, along with an interferometric optical setup, high-speed images were taken of the bottom of the splashes of glycerol/water solutions. The apparatus consisted of a needle attached to moveable post, allowing for changes in drop height/impact velocity. The drop would fall out of the needle (using a controlled syringe pump) onto a glass slide, under which was an interferometric optical setup that allowed for videos of the bottom of the splash to be recorded. Glycerol/water solutions were used because of their large range of viscosities while maintaining mostly constant surface tensions. Imaging of the splashes suggests that trickle events depend on viscosity and on impact velocity of the drop. These parameters determine the properties of trickle events, such as size, number, and circular character. Viscosity and impact velocity also determine the occurrence and time of formation of trickle events. A qualitative analysis of the high-speed videos shows six unique phases depending on viscosity and impact velocity, among which the properties of the trickle events mentioned above change significantly.

Awards Won: