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**Modeling of Volcanic Ash Impingement in Gas Turbine Engines**[1]

DRUE SEKSINSKY, JEFFREY MARSHALL, University of Vermont — Impact of volcanic ash particles on heated surfaces of gas turbine engines (GTEs) are a significant concern for the aviation community. Deposition of molten volcanic ash particles within GTEs has led to aircraft engine damage and shut-down, as well as airspace closure within a wide region surrounding volcanically active areas. Unlike most studies of droplet-surface impact, in this problem the molten liquid viscosity is sufficiently large that the droplet Reynolds number (Re) is significantly less than unity. The research describes numerical simulations of low Re droplet impact using the combined level-set volume-of-fluid (CLSVOF) method, as well as a simplified theory for the low Re impact process. Two distinct phases of the low Re droplet impact process are observed. In the first phase, the droplet kinetic energy decreases rapidly, which is roughly balanced by the energy dissipation. In the second phase, the droplet motion is controlled by potential energy balance with viscous dissipation. The second phase occurs over a time period that is much larger than that of the first phase. Since there is little experimental data for droplet collisions in this regime, we are using our numerical results to guide and validate the theory development.

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