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Surface Seal in the Water-Entry of Hydrophobic Spheres BENJAMIN JACKSON, SUNGHWAN JUNG, PAVLOS VLACHOS, Virginia Tech — We examine the surface seal phenomenon observed in the water entry of hydrophobic spheres. Using high speed shadowgraph imaging we experimentally investigate the dependence of surface seal time and critical pressure on projectile size, density, and impact velocity. In the initial stage of impact the projectile slams into the free surface projecting a splash curtain upward. As the projectile descends into the fluid, an air cavity forms behind it and eventually pinches off from the atmosphere. Previous studies have primarily focused on the low velocity case where surface seal does not occur and the events above the free surface are often ignored. As the projectile velocity increases, the pressure drop within the cavity increases. Surface seal occurs when this pressure drop exceeds a critical pressure and is characterized by the closure of the splash curtain. The splash curtain domes over and seals the cavity above the free surface. This dome closure emits a downward jet which propagates into the air cavity from above and affects the later cavity dynamics. We present scaling arguments for critical pressure and surface seal time based on our observations.

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