Abstract Submitted
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Make water entry great again![1] RANDY HURD, Utah State University, JESSE BELDEN, MICHAEL JANDRON, Naval Undersea Warfare Center, TATE FANNING, Brigham Young University, TADD TRUSCOTT, Utah State University — Upon free surface impact, silicone rubber spheres deform significantly and begin to vibrate producing unique nested cavities. We show that sphere deformation and cavity formation can be characterized by material shear modulus, density and impact velocity. Additionally, material vibration scales with sphere diameter and material wave speed. Applying a modified diameter, which reflects deformation, effectively collapses experimental pinch-off data with Froude number. A scaling argument shows that a deformable sphere loses energy proportional to the vibrational period of the sphere in the first stages of impact. The effective force coefficient of a deformable sphere through impact is nearly identical to a rigid sphere with the same solid-liquid density ratio. The scaling predicts how the cavity and projectile dynamics of a deformable sphere differs from a rigid counterpart.

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