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Please comply: the water entry of soft spheres JESSE BELDEN, Naval Undersea Warfare Center , RANDY HURD, Utah State University, TATE FANNING, Brigham Young University, MICHAEL JANDRON, Naval Undersea Warfare Center, JOHN REKOS, University of South Florida, ALLAN BOWER, Brown University, TADD TRUSCOTT, Utah State University — The typical phenomena associated with sphere water impact are significantly altered when the sphere material is highly compliant rather than rigid. We describe the water impact physics of homogenous and hollow elastic spheres. The homogeneous spheres undergo large oscillatory deformations throughout entry that carve nested disturbances into the normally smooth air cavity, altering cavity shape and pinch off. Using an analytical model, we relate the maximum sphere deformation to the material properties and impact velocity. This characteristic deformation is used to reconcile the differences between cavities formed by compliant and rigid spheres. In addition to the nested disturbances seen with the homogeneous spheres, we observe azimuthal irregularities on the cavity during water entry of hollow elastic spheres. Based on experiments and finite-element modeling, we suggest that these disturbances are initiated by vibration mode shapes excited in the hollow spheres upon impact. For all sphere types, we compare the forces throughout water entry to the rigid sphere case.

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