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Pop up height of buoyant spheres TADD TRUSCOTT, RANDY MUNNS, Brigham Young University, SPLASH LAB TEAM — We examine the rising and surface breaching dynamics of buoyant spheres released at varying depths beneath the free surface in water over a range of Reynolds numbers ($\mathrm{Re} = 3 \times 10^4$ to 5×10^5 using high-speed imaging and particle image velocimetry. Buoyant spheres of sufficient speed pop up out of the free surface in varying ways depending on the conditions under the surface. Altering the release depth reveals varying exit angles, velocities, accelerations, and pop up heights at surface exit. Vortex shedding prior to free surface exit causes decelerations contributing to the variation in exit velocities and resulting pop up heights. Through a comprehensive study the phenomenon is extremely predictable. At lower Re, spheres released from shallow depths result in greater accelerations, velocities and pop up heights at the free surface compared to lower pop up heights when released from deeper depths (contrary to intuition). As the depth of release is increased the pop up height oscillates between a maximum and minimum. This is directly related to the proximity of the shed vortex to the free surface. For spheres of greater Re, pop up height increases linearly with release depth, demonstrating continued accelerations at free surface exit.

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