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Negatively buoyant fluid projectiles OLE JOERGEN MYRTROEEN, GARY R. HUNT, Imperial College London — We describe the rise-height behaviour of a finite volume saline release dispensed vertically upwards into a still fresh-water environment. The dynamics of the non-continuous release, or projectile, differ significantly from the continuous version that produces a turbulent fountain. The projectile can be characterised in terms of the release aspect ratio L/D (the length L of the dispensed column to the nozzle diameter D) and the source Froude number Fr_0, expressing the ratio of inertia and buoyancy. In a continuous high Reynolds number fountain $L/D \to \infty$ and the behaviour is characterised solely by Fr_0. We dispensed, over a time t_d, each release and recorded the extent of its maximum vertical propagation as a function of L/D and $Fr_0 = (L/t_d)/(g'D/2)^{1/2}$, where g' denotes the reduced gravity of the fluid released. For $Fr_0 \to \infty$, the release propagates as a vortex ring with a trailing jet for $L/D > 4$. As Fr_0 decreases, gravitational effects limit the vertical propagation and a maximum rise height z_m/D is reached. We find that the releases are sensitively dependent upon Fr_0 and L/D and three rise height regimes, 'the weak fountain regime', 'the vorticity development regime' and 'the forced release regime', are identified by considering rise heights and morphologies. Finally, we discuss some aspects of the transition from a non-continuous release to the continuous fountain as achieved on increasing L/D.

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