Fractional Change in Displacement of Vertical Profiler During Deployment

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$M_{mvp} := 280 \cdot lb$ — Mass of the vertical profiler

$D_p := 2.5 \cdot in$ — Diameter of the Buoyancy Engine piston

$L_p := 12.5 \cdot in$ — Length of travel of the Buoyancy Engine piston

$\rho_s := 1025.5 \cdot \frac{kg}{m^3}$ — Average density of seawater

$percent \equiv 0.01$

$$m_d := \frac{\pi \cdot in \cdot D_p \cdot L_p \cdot \rho_s}{2}$$

$m_d = 0.825 \ kg$ — Mass displaced by piston plus or minus from neutral

$$\delta_d := \frac{m_d}{M_{mvp}}$$

$\delta_d = 0.65 \ percent$ — Fractional change in displacement from neutral

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$$v_{mvp} := \frac{M_{mvp}}{\rho_s}$$

$$v_{mvp} = 0.124 \cdot m^3$$ Volume displaced by MVP

$$\rho_s := 1023.5 \cdot \frac{kg}{m^3}, 1023.6 \cdot \frac{kg}{m^3} .. 1027.5 \cdot \frac{kg}{m^3}$$ Define a range of seawater densities

Graph the change in MVP bouyancy caused by changes in seawater density, and compare that to the total amount the MVP bouyancy can change due to the buoyancy engine. Assume the MVP is neutrally ballasted at a seawater density of 1025.5 kg/m^3, and that seawater density changes approx. 0.2% up and down.