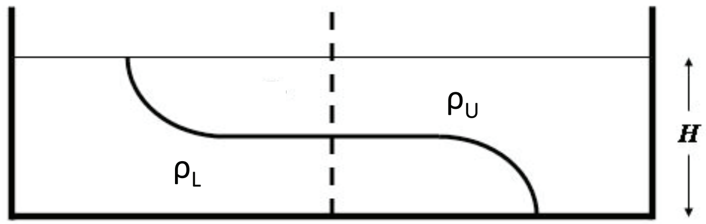
Reduced gravity



A schematic of a lock exchange experiment. In this case fluid of density ρ_U is separated by a vertical partition – the lock gate – from denser fluid with density ρ_L. Both fluids are initially at rest. When the gate is removed a dense gravity current will flow along the bottom to the right and a buoyant current will flow along the top to the left

$$\frac{\partial p}{\partial z} = -g\rho$$

Integrate down from the surface

$$p = -g \int_0^H \rho \, \mathrm{d}z$$

$$\Delta p = g(\rho_L - \rho_U) = g\Delta\rho H$$

Now

pressure difference = mass x acceleration/area

Since mass = density x volume,

$$\Delta p = \rho H a$$

where a is the acceleration. Hence

$$a = g\frac{\Delta\rho}{\rho} \equiv g'$$

Reduced gravity - "g prime"