Geophysical Fluid Dynamics Laboratory - Research School of Earth Sciences

Dense Gravity Currents

1) Fill the long channel with tap water to a depth of about 20cm.

2) Insert the sliding barrier about 30cm from one endwall. Dissolve ~25 grams of salt into the water behind the barrier, along with a few drops of yellow dye.

3) Equalise the bottom pressures across the barrier.

4) Measure the water depths and densities of both chambers.

5) Carefully remove the sliding barrier and allow the gravity current to initiate. Measure the time taken for the leading edge of the gravity current to travel 1m (e.g., from 0.8m to 1.8m along the tank).

6) Thoroughly mix the entire tank. Reinsert the barrier and dissolve ~50 grams of salt into the small chamber along with some coloured dye. Repeat steps 3-5 for this second case.

7) Repeat this process with 100, 200, and 400 grams of salt dissolved into the small chamber. This gives you a set of 5 experiments, where the variable is the density difference, and the observable is the current velocity.

The predicted velocity *U* of the gravity current is estimated as,

$$U = 0.5\sqrt{\frac{gH\Delta\rho}{\rho_0}},$$

where g is the gravity, H is the water depth, $\Delta\rho$ is the density difference of the waters, and ρ_0 is the reference density (ρ_0 = 1000kg/m^3).

Produce a plot of the measured current velocity compared to the predicted current velocity.