**Geophysical Fluid Dynamics Laboratory - Research School of Earth Sciences**

**Intruding Gravity Currents**

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

2) Insert the sliding barrier at the centre of the tank. Dissolve ~250 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 densities of both chambers.

5) Carefully remove the sliding barrier and allow the stratification to settle.

6) Reinsert the sliding barrier about 30cm from one endwall. Thoroughly mix the water behind the barrier, and add a few drops of a different coloured dye.

7) Measure the density of the water behind the barrier.

8) Carefully remove the barrier and allow the intruding gravity current to initialise. Measure the time taken for the leading edge of the intruding gravity current to travel 1m through the tank (e.g., from 0.8m to 1.8m along the tank). Make note of the vertical extents of the upper and lower edges of the current head to the interface depth.

9) Thoroughly mix the entire tank, reinsert the barrier at the centre of the tank, and dissolve ~500 grams of salt and coloured dye into one side.

10) Repeat steps 3-8, and step 9 but with 750 grams of salt. If time permits, try again with 1kg of salt.

This process should give you at least 3 sets of density differences and measure current velocities. The predicted velocity of the lower portion of the intruding gravity current is estimated as,

$$U_L = \sqrt{\frac{2gh_L(\rho_L - \rho_i)}{\rho_0}},$$

where g is the gravity, $h_L$ is the vertical extent of the lower portion of the current, $\rho_L$ is the density of the lower water, $\rho_i$ is the density of the intruding gravity current, and $\rho_0$ is the reference density ($\rho_0$ = 1000kg/m$^3$).

Similarly, the predicted velocity of the upper portion of the intruding gravity current is estimated as,

$$U_U = \sqrt{\frac{2gh_U(\rho_i - \rho_U)}{\rho_0}},$$

where $h_U$ is the vertical extent of the upper portion of the current, and $\rho_U$ is the density of the upper water.

Produce a plot comparing the measured current velocities with the predicted velocities.