SMS-303: Integrative marine sciences III.

Lab 1, Waves.

Material: ADV, small and large fluid vessels, bucket with warm, cold and cold salty waters (each colored with a different food coloring).

Shallow water gravity waves have period that depend on gravity ($g=9.81 m/s^2$) and depth (H). Express the likely relationship between their period (T), their propagation velocity (c) and (g, H).

Stations:
I. You are about to measure the period of wave sloshing back and forth in a small vessel.
Q: Which do you expect to propagate faster: a wave in a tank with little water or that where the water is deeper?

Measure(using a stopwatch) how many sloshing back and forth you get in a tank with little water (1.5cm) and one with 4 times the depth (6cm). How much faster is one from the other? Is it consistent with the dependence you derived from dimensional analysis above?

II.
Buoyancy oscillations:
In a tall cylinder with salty/cold water on the bottom and fresh water on top you have a floating object parked between the fluids.
Q: What will happen if you push the egg down? Why?
Measure with a stop watch the time scale of the egg movement. What should it be based on dimensional analysis?

III.
Internal waves:
You have a small tank with a partition in the middle separating two fluids (cold and hot).
Q: What will happen when you raise the partition between the fluids?
Remove the partition. What is happening? Measure with a stop watch the time scale of the interface movement. What should it be based on dimensional analysis?
How many oscillation modes do you have in the tank? Put your finger in, can you feel the different waters?

You have a large aquarium with a stratified fluid. Can you set up the internal mode?

IV.
Slinky- use a slinky to make a transverse wave and a longitudinal wave. Classify sound, light, gravity, capillary and internal waves as transverse of longitudinal.

V.
Large tank with paddle + current meter (ADV) attached to a computer.
A power supply is attached to the paddle allowing us to change its frequency.

a. Q: How do you think the wave amplitude will change with the frequency of the paddle?

Using the ADV measure the velocity at a point within the middle of the fluid. Change the voltage from 10→17V in increment of 1V and plot the change in mean along channel velocity as function of voltage. How do you explain your observations?

b. Observe particles within the fluid. How are they distributed? Why?

c. Observe the behavior of the beach as you change the forcing. How is the beach changing? How is the change of the beach affecting the waves (e.g. *feedback*)?

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