SMS-303: Integrative marine sciences III.

Lab 4, Coriolis.

Stations and activities:

I. Cannon shooting Coriolis activity from:
http://des.memphis.edu/lurbano/vpython/coriolis/Coriolis_model.html

Experiment with the program. Start by picking a rotation direction.
Predict the trajectory in the inertial frame and in the rotating frame.
Shoot the cannon and observe the resulting trajectories. Change the rotation direction and observe the changes. Once you feel comfortable with these changes:
1. Add friction. Predict what will happen and compare to what happens.
2. Move the cannon. Predict what will happen and compare to what happens.

II. Rotating table Coriolis:
Spin the table and, when you can, release the ball into it through the duct on its side (it will take you a little time to get used to this simple setup).
Predict to what direction the bead will be deflected as function of the direction of rotation. Now, observe how the deflection direction and intensity varies with the spin direction and intensity.
How is this setup different from that in station I (think about the relative velocity of the bean and cannonballs when they leave the duct/cannon)?

III. Rotating flow over topography (from:
http://www.ocean.washington.edu/courses/oc512/lab2-2004.pdf also in introduction to GFD, by Cushman-Roisin).

Put some dye (a permanganate crystal) on top of the 'sea mount' and a different dye around it. Observe the fluid at rest relative to the rotating fluid. You are about to change the rotation rate. What do you think will happen to the fluid?
Decrease a little the rotation rate (by decreasing the voltage). Observe the fluid flowing towards the 'seamount'. Does it climb over it?
What is happening to the dyed fluid?
The fluid in the tank has a specific angular momentum based on its motion, distance from the center and depth. If it were to climb the 'seamount' it will need to changed its height (and become fatter); if it did that, its velocity will need to change prompting it to stay away from the seamount.

IV. Coriolis in a fluid

A syringe with dye is attached to a rotating tank at solid body rotation. What do you think will happen when you skirt fluid into the tank at mid depth in direction of its center? Do it, and observe what happens to the fluid (Is it deflected?).

How does it compare to an analogue setup that does not rotate? Compare the fluid in both setups. Do they develop differently following the injection?

This page was last edited on 12/17/2005