Problem Set #1
OS/ES 172/272: Geophysical Fluid Dynamics
Due: Thursday, April 9, 2020

Read the analytical sections of Chapter 2.

1. Cushman-Roisin Analytical Problem 2-1.

2. Cushman-Roisin Analytical Problem 2-3.

3. Suppose a sudden gust of wind blows over the ocean at $60^o N$, and initiates motion of the surface water. If the water moves with speed $0.25\, ms^{-1}$ what is the diameter and period of the inertial motion that would be observed? What about at $5^o S$? In a sentence answer the following: Are inertial circle radii and periods larger or smaller at higher latitudes than lower latitudes?

4. A laboratory tank consists of a cylindrical container 30 cm in diameter, filled at rest by 20 cm of fresh water and then spun at 30 rpm. After a state of solid-body rotation is achieved, what is the difference in water level between the rim and the center? What is the depth of the fluid at the center of the tank?

5. It is common for balls moving on merry-go-rounds to be used as a demonstration of the Coriolis force. Typical merry-go-rounds have flat surfaces. State in words why this model is not a faithful representation of the Coriolis force in isolation? Hint: Imagine dropping some paint onto a (rapidly) spinning merry-go-round and compare that to what should happen with dropping some dye into a tank of water rotating in solid-body rotation. What is the major difference in the forces?

6. Cushman-Roisin Analytical Problem 2-5.