Problem set 1: GEF2220: Due 18 Feb., 2011

Problem 1: Bathtub

David Letterman once called a man in South America to ask whether the water swirled clockwise when flowing out the drain in his bathtub. Is there a preferred tendency in a bathtub, due to rotation?

Assume the bathtub is 1.5 m long and that typical velocities in the water are about 1 cm/sec. The bathtub is at 45 N. Explain whether or not there is a preferred sense of rotation, and if yes, what sign?

Problem 2: A low

Say we have a low pressure system with a pressure drop of 0.12 Pa over 10 km. The depression is at 5 N. Is it cyclonic or anticylonic? What is the velocity at 10 km? Assume $\rho = 1.2\, kg/m^3$.

Problem 3: Problem 7.18, Wallace and Hobbs

Problem 4: Problem 7.19, Wallace and Hobbs

Problem 5: Problem 7.21, Wallace and Hobbs

Problem 6: Problem 7.26, Wallace and Hobbs

Problem 7: A useful relation

Show, for an adiabatic process ($dq = 0$), that:

$$p\rho^{-\gamma} = const. \tag{1}$$

where:

$$\gamma = \frac{c_p}{c_v} \tag{2}$$