

Atmospheric Convection

PHYS 536

Fall 2015

Problem Assignment # 1

due 08-28-15

1. **Approximating fluid motions** (5 points)

- (a) What is hydrostatic balance?
- (b) What is the anelastic approximation, and when is it applied in the Earth's atmosphere?
- (c) What is the Boussinesq approximation and when is it valid?

2. **Vertical Boussinesq Navier-Stokes Equation** (8 points)

- (a) Starting with equation 1.3.7, apply the Boussinesq approximation, divide the pressure into its hydrostatic and nonhydrostatic parts, and derive the vertical Boussinesq Navier-Stokes Equation (equation 1.3.10).
- (b) Using the scaling suggested in the text, derive the scaled form of the vertical momentum equation (1.3.16).

3. **Buoyant parcels** (10 points)

Emanuel problems 1.1-1.4.