Geophysical Fluid Dynamics

PHYS 527   Fall 2016

Problem Assignment # 5

1. **Conservation of circulation in adiabatic baroclinic flow** (6 points)

   (a) Vallis problem 2.3 (yes, chapter 2).

   (b) Show that circulation is conserved in baroclinic flow if the flow is also adiabatic. (Hint: See section 4.3.3)

2. **The beta effect** (6 points)

   (a) Show that circulation is conserved in rotating, barotropic flows (section 4.3.4).

   (b) Show that a change in latitude can change relative vorticity (section 4.4.1).

3. **PV conservation** (3 points)

   In class, we demonstrated PV conservation from the circulation theorem (section 4.5.1). Red-erive PV conservation using either the "frozen-in" property or from an algebraic derivation.

4. **Conservation of circulation in a vr vortex** (4 points)

   Vallis problem 4.1.

5. **Solenoids and sea breezes** (8 points)

   Vallis problem 4.8.