

# UCF Physics: AST 6165 Planetary Atmospheres

## Spring 2020 Homework 11 DUE Thursday, 16 April 2020

Reading for this assignment: Andrews, 5.1.

Problems:

1. (10 points, source: Holton) An air parcel at  $30^\circ$  N moves northward conserving absolute vorticity. If its initial relative vorticity is  $5 \times 10^{-5} \text{ s}^{-1}$ , what is its relative vorticity upon reaching  $90^\circ$  N?
2. (10 points, source: Holton) An air parcel at  $60^\circ$  N with  $\xi = 0$  initially stretches from the planet's surface at geoid height to a fixed tropopause at 10 km height. If the air column moves until it is over a mountain 2.5 km high at  $45^\circ$  N, what are its absolute vorticity and relative vorticity, assuming that the flow satisfies the barotropic potential vorticity equation:

$$\frac{D}{Dt} \left( \frac{\xi + f}{h} \right) = 0, \quad (1)$$

where  $h$  is the column (layer) height?

3. (20 points) Describe in detail what would happen if a circulating high-pressure system drifted across the equator.