NAME: _____ SECTION _____

Atmospheric Sciences 101 Spring 2013
Homework #6 (Due Thursday, 16 May 2013)

1. Forces Affecting Air Flow.

Below is an air parcel in between two 500mb heights contours.

a. **Carefully** draw arrows indicating the direction and relative strength (use the length of the arrow to indicate) of the forces involved (for the Northern Hemisphere). Also draw an arrow indicating the resulting wind direction. Label all arrows. [1.5]

_____ 5600m

_____ 5640m

b. What would you expect to happen to the magnitude of the wind speed if the 500mb height along the 5600 metre contour was decreased to 5560 metres while the height along the 5640 metre contour remained unchanged? [0.5]

Below is an air parcel in between two surface isobars.

c. Carefully draw arrows indicating the direction and relative strength (use the length of the arrow to indicate) of the forces involved (for the Northern Hemisphere). Also draw an arrow indicating the resulting wind direction. Label all arrows. [2]

_____ 1016mb

_____ 992mb

2. Atmospheric Pressure. Consider two continental (non-coastal) weather stations, one located in central Alaska (cold) and one located in southern Texas (warm). Both stations are at the same elevation, approximately 400m above sea level.

a. If the surface pressure at both locations is 970mb, how do the number of air molecules above a 1 m × 1 m square area compare at these two locations. [0.5]

b. On a winter day both locations happen to have identical surface pressure. Consider a vertical column above each location. In which column is the air most likely to have a higher density? Briefly explain. [1]

c. Under the same conditions described in part b, above which location would most likely have a higher 500mb height? Briefly explain. [1]

3. Winds and Air Flow

a. Consider upper level air flow in the Northern Hemisphere that is in geostrophic balance. The winds are blowing parallel to the height contours. What two forces are contributing to this observation? [1]

b. Suppose the rate of rotation of the Earth increased. How would the forces and wind be different? This is a tricky question - consider the equation for the Coriolis force and balanced flow. [0.5]

c. Now suppose there is a low pressure centre in the Northern Hemisphere located near the surface. What additional force(s) affect the winds? Does this change the direction of the winds? If so, what direction do the winds blow? [2]