Name: _____

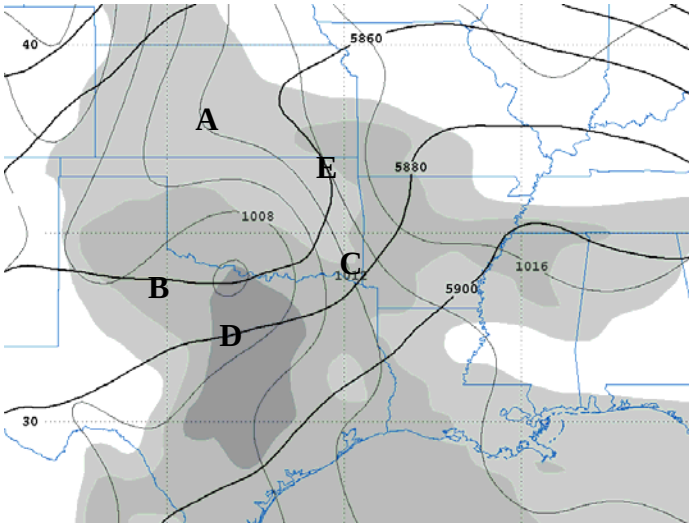
MEA 443 SYNOPTIC WEATHER ANALYSIS AND FORECASTING
FALL 2010
Quiz 3, Thursday 9/9/2010

1.) Consider the thermodynamic equation as written below.

$$\frac{\partial T}{\partial t} = -u_g \frac{\partial T}{\partial x} - v_g \frac{\partial T}{\partial y} - \omega \frac{\partial T}{\partial p} + \frac{\sigma p}{R} \omega + \frac{J}{C_p}$$

Which, if any, of the terms in this equation are inconsistent with the standard quasigeostrophic (QG) assumptions? For any terms you identify, explain which QG assumption is in conflict.

2.) Tropical Storm Hermine made landfall near south Texas this week, and has moved north to near the Texas-Oklahoma border as shown in the image below. This graphic shows the lower-tropospheric water-vapor mixing ratio (shaded), sea level pressure (light gray contours), and 500-mb height (darker, thicker contours).



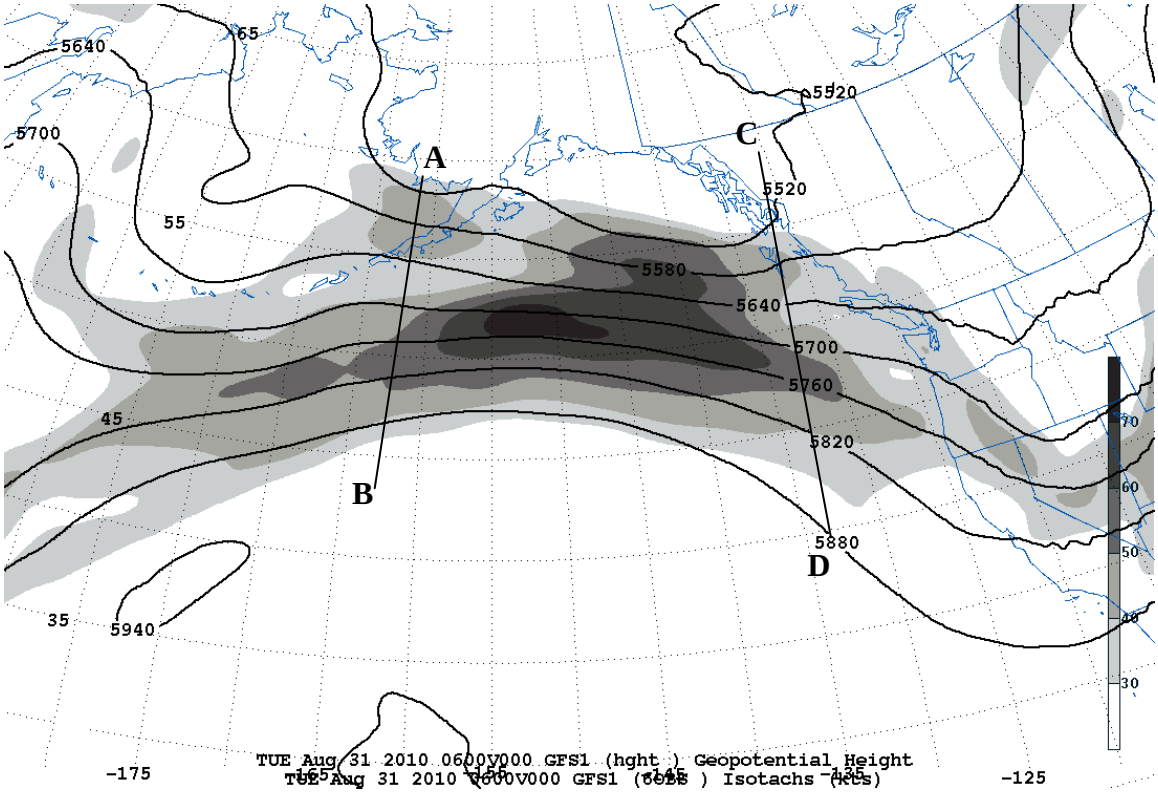
a.) On the map above, outline and cross-hatch the area(s) you would most expect to be experiencing heavy rainfall at this time.

b.) Briefly explain/justify your answer to a.) in 2 or fewer sentences below.

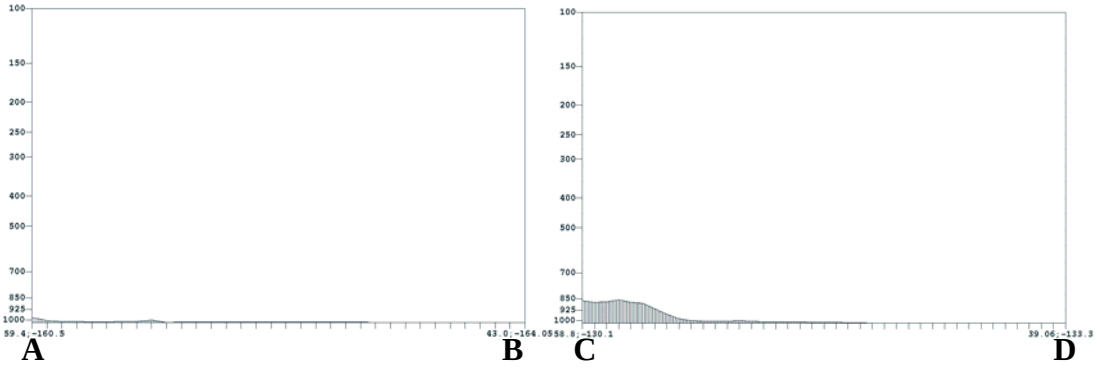
c.) Use the information available in the graphic, and the QG omega equation, to match the locations above (points A-E) to the *most likely* weather conditions below.

____ Rain, with strong warm advection
____ Rain, but weak temperature advection
____ Warm and humid. Convective storms possible; weak QG forcing
____ Mostly clear skies, precipitation unlikely

3.) As shown below, a reasonably straight jet streak was present over the eastern North Pacific Ocean in late August. The 1000-mb surface was relatively flat compared to the 500-mb surface. This graphic shows isotachs (shaded), and 500-mb height contours (solid contours). Use this graphic to answer the following questions.



a.) The cross-section locations shown below are approximately indicated on the map above. Using your knowledge of QG dynamics, sketch the approximate ***ageostrophic circulation*** that you would expect to find along these sections. Draw the circulation as a set of vector arrows.



b.) For section A-B, is the circulation thermally direct or indirect? _____
For section C-D, is the circulation thermally direct or indirect? _____

c.) Circle and shade lightly the regions where you would most expect to find ascent, based on QG reasoning.