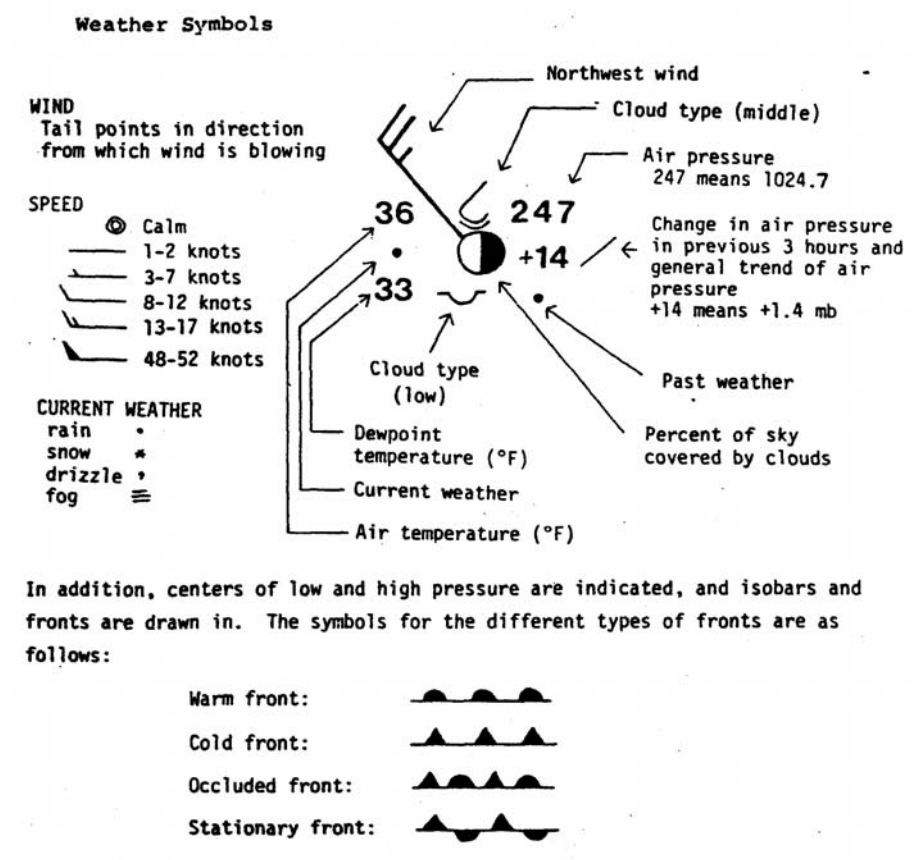
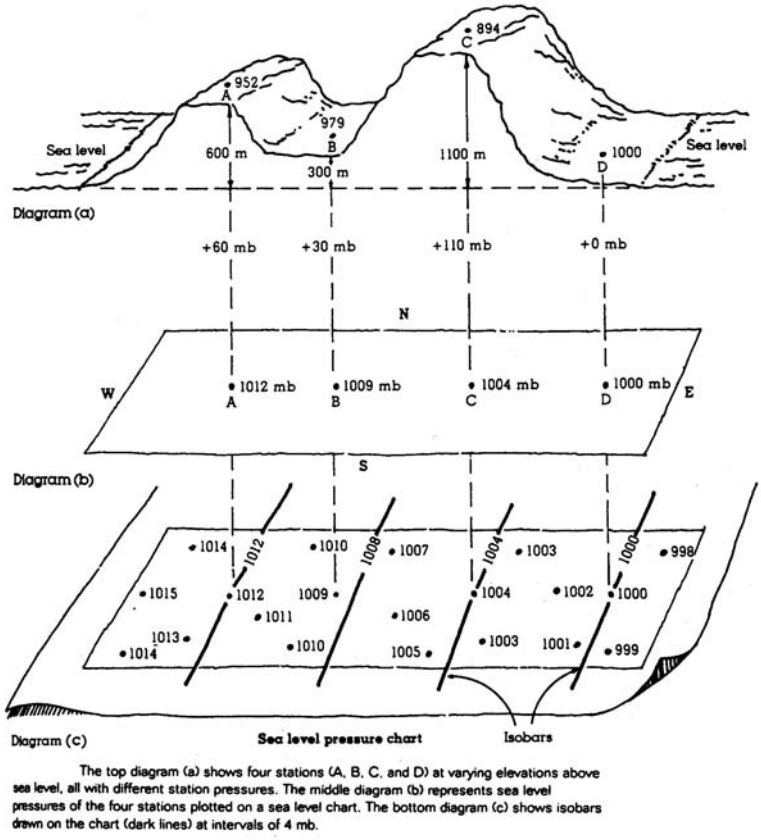
Geog 531 Exercise #2
UNDERSTANDING SYNOPTIC CHARTS

(Please answer right on this handout where sketches are requested in Question # 1, # 4, and # 6b. For the other questions, type out your answers and staple them to the handout.)

First, a review of the weather map symbols we'll use in this exercise (there are many more; this is an abbreviated look:





The top diagram (a) shows four stations (A, B, C, and D) at varying elevations above sea level, all with different station pressures. The middle diagram (b) represents sea level pressures of the four stations plotted on a sea level chart. The bottom diagram (c) shows isobars drawn on the chart (dark lines) at intervals of 4 mb.

Now an explanation of how a "surface" pressure pattern map pattern is constructed

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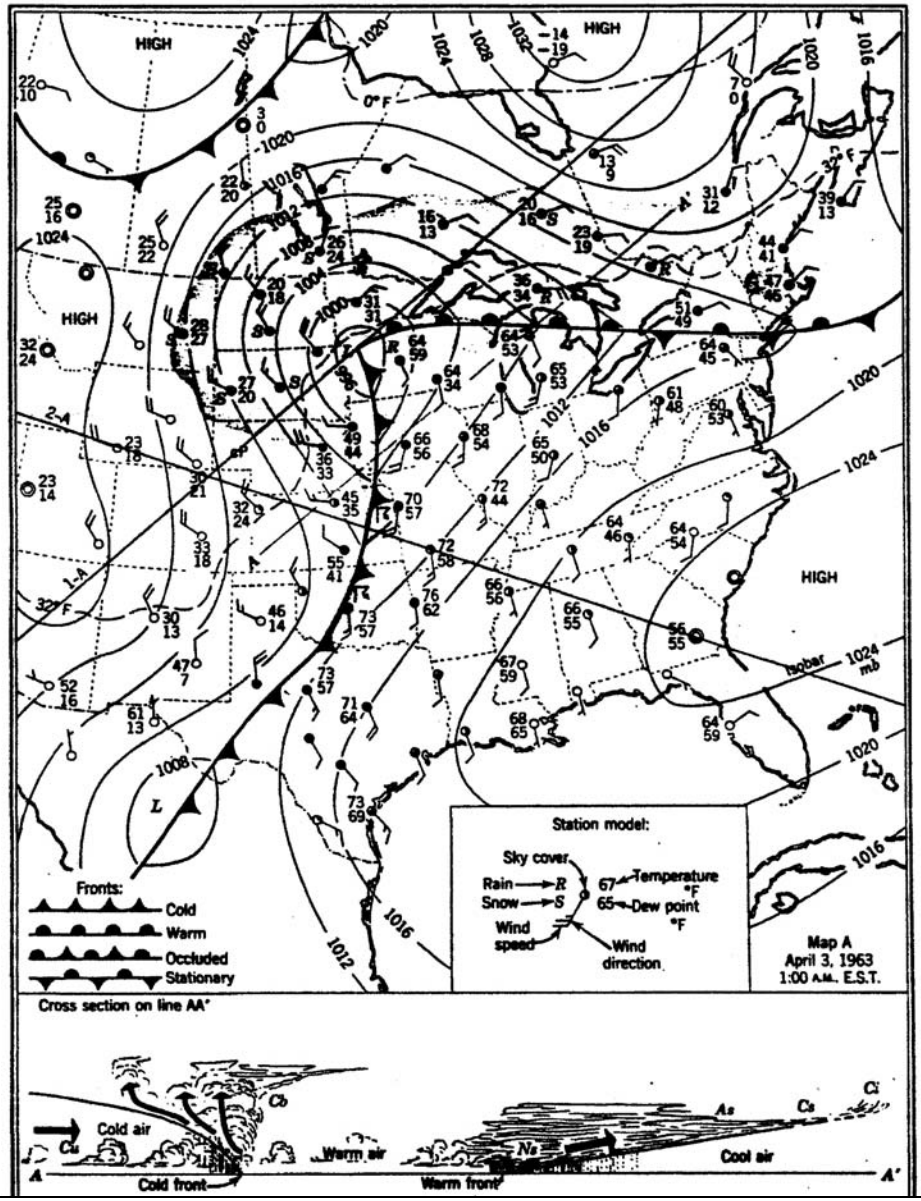
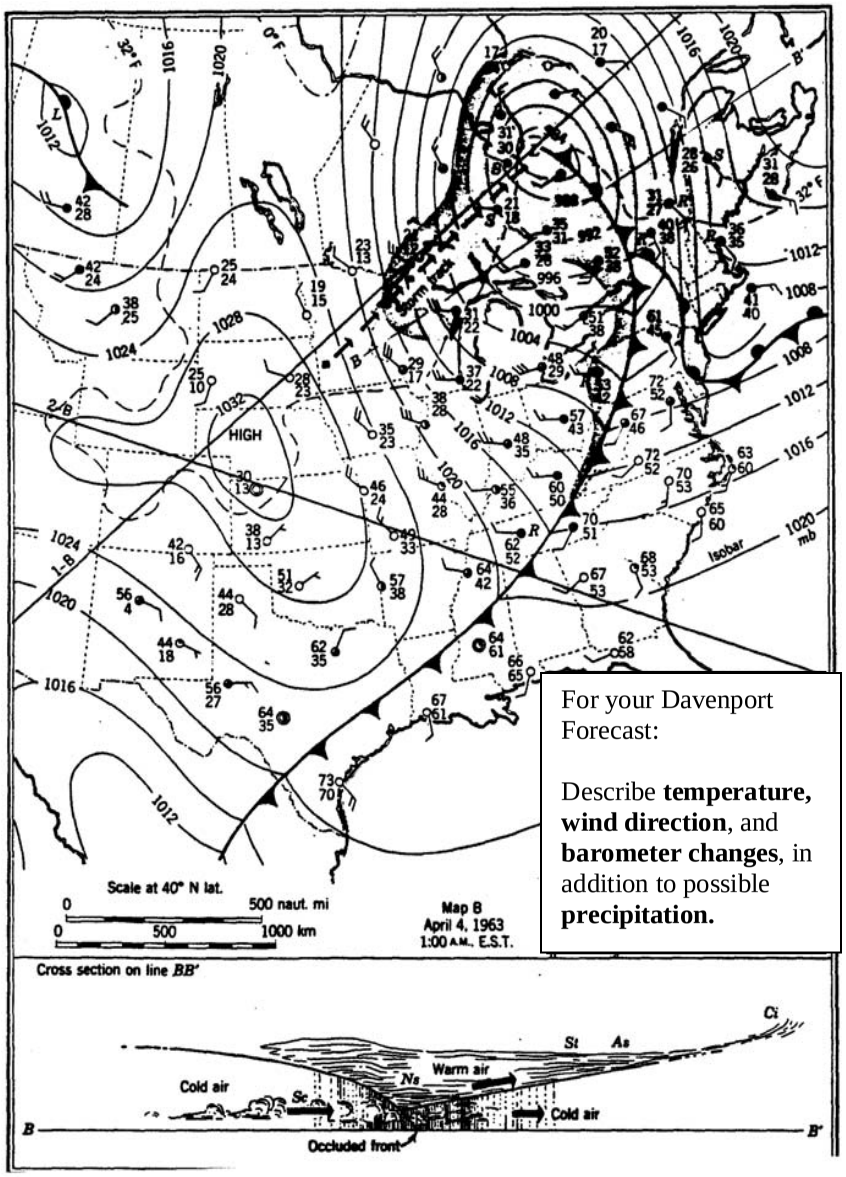
NOTE:

Start with QUESTION #1 even though it is on the very last page!!!





For your Davenport Forecast:

Describe **temperature, wind direction**, and **barometer changes**, in addition to possible **precipitation.**

Question #2 Weather Chart

(a) On the map, locate line AA' and look at the cross section below the map. On the map *and* cross section LABEL the general regions that would be dominated by mT air(maritime tropical air mass), cP air (continental polar air mass), and mP air (maritime polar air mass) for the North Atlantic Ocean.

(b) **Compare air and dewpoint temperature at New Orleans, Boston, and Albuquerque and briefly discuss differences among the three cities in terms of air masses, air temperatures, relative humidity and saturation.**

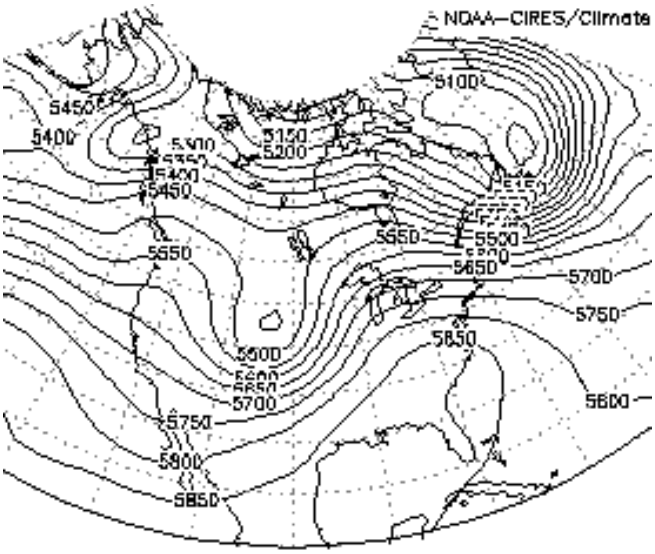
Questions #3 Weather Changes

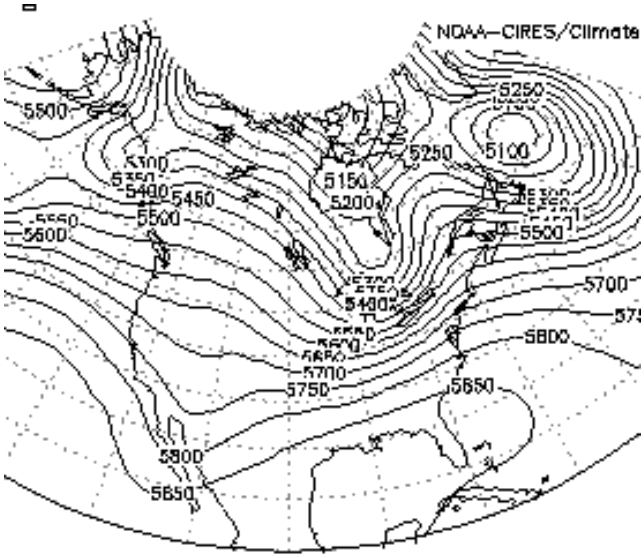
(a) On this map, locate line BB' and compare with the BB' cross section. LABEL regions of mT, cP, and mP air on the map and cross section.

(b) Referring back to Map A (Question #2) and knowing that the center of the LOW is moving along the track defined by line 1-A**, make a weather forecast for the city of Davenport, Iowa** located on the Mississippi River (Iowa-Illinois border) for the time BETWEEN Map A and Map B.

Question #4 Link between Surface and Upper Level Maps

Here are the corresponding 500 mb geopotential height maps for April 3 & April 4, 1963:

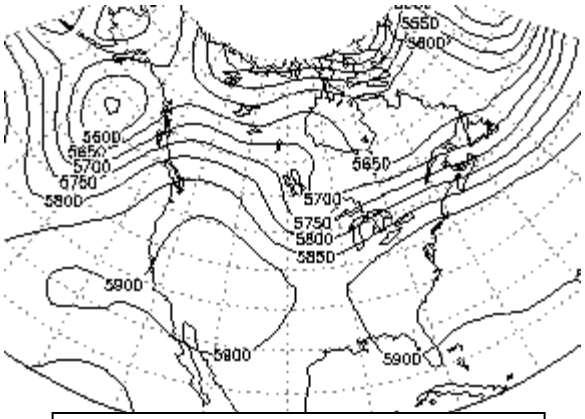




On the maps above, **sketch in the approximate location of the surface low pressure center and fronts** (i..e., the big extratropical cyclone) seen on the surface weather maps for April 3 & 4. **Where are the surface low, warm fronts and cold fronts in relation to the upper level ridge and trough pattern on each day? Does this fit with what we've learned about the link between surface and upper level circulation patterns?**

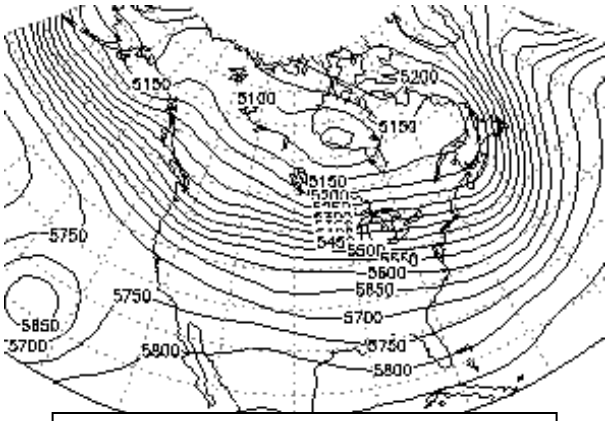
Question #5 Seasonal Differences in Upper Level Circulation

In the middle latitude regions of the globe, both the movement of air masses and surface weather conditions are influenced by the strength of the westerlies and the upper level long wave patterns of circulation. The westerlies vary in strength from summer to winter. The cause of variation in the strength of the winds is illustrated in the two upper level maps at right by the spacing of the 500 mb contours on the maps.



July 21, 1980 500 mb ht (m) 12Z

(a) During which <u>season</u> (summer or winter) would you expect the stronger flow in the upper level westerly winds? Why?

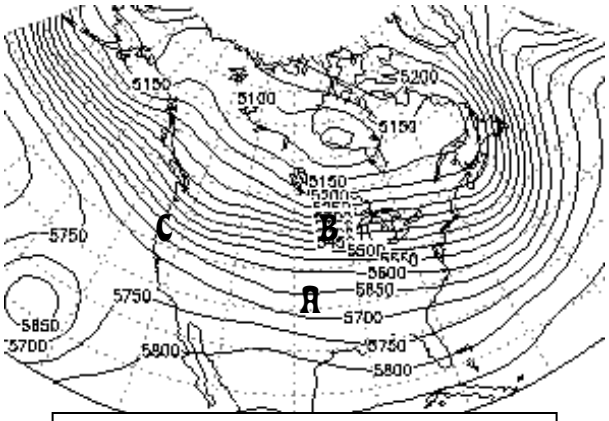


Dec 15, 1958 500 mb ht (m) 12 Z

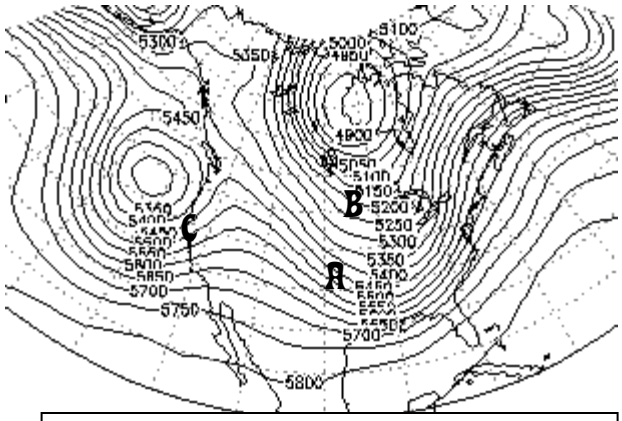
(b) Describe a few other <u>key differences</u> between <u>summer and winter upper level charts</u> based on these two examples. (Hints: latitude of the jet stream / circumpolar vortex, height of the 500 mb surface, etc.)

Question # 6 Linkages between Upper Level Charts & Surface Weather

The upper level long wave circulation changes in form, at some times flowing in a smooth west-east zonal pattern and at others flowing in waves extending north and south, producing strong meridional flow. Such changes strongly influence surface weather patterns. Examples of this type of variation can be seen in the comparison of the Dec 15, 1978 and Jan 14, 1979 500 mb circulation patterns below:



Dec 15, 1958 500 mb ht (m) 12 Z



Jan 14, 1979 500 mb ht (m) 12 Z

Approximate high and low temperature data (in ºF) are listed below for three sites (A, B & C) on the two dates to illustrate the relationship between the upper level longwave pattern and temperature at the surface :

	Site A	Site B	Site C
Dec 15, 1978	High 55 ºF Low 20 ºF	39 ºF 22 ºF	44 ºF 38 ºF
Jan 14, 1979	High 17 ºF Low 2 ºF	9 ºF -20 ºF	56 ºF 44 ºF

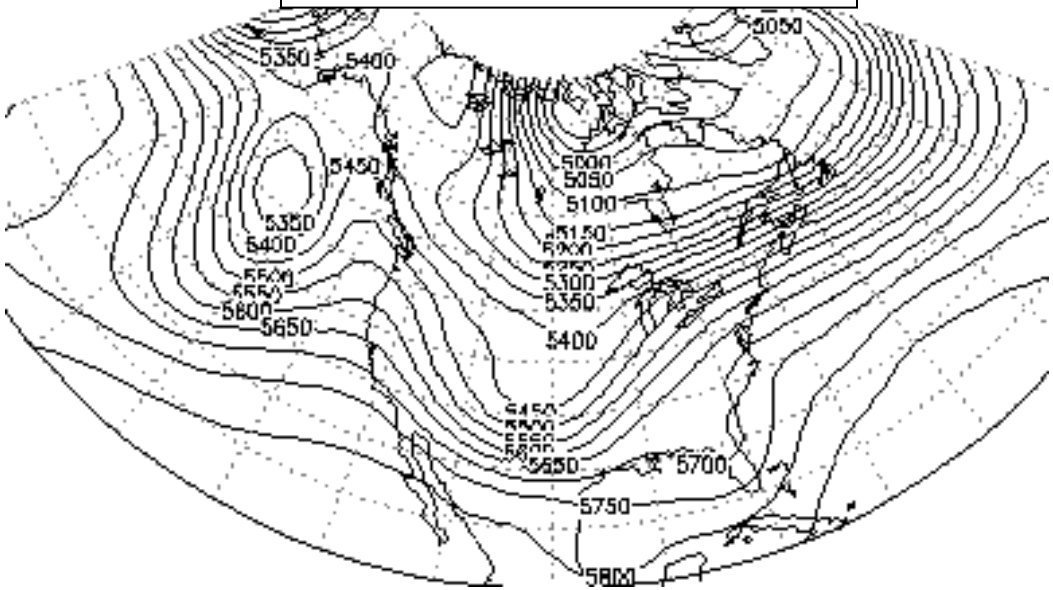
(a) Use the upper level longwave pattern to briefly explain the variations in temperature from site to site on each day and the temperature difference between the two days at the same site (e.g., why so cold, or mild, probable type of air mass (mP , cP, mT) influencing the site, whether flow is zonal or meridional, whether a trough or ridge is influencing the temperature, etc.) *(Use the table below for notes, then type out your answer separately.)*

	Site A	Site B	Site C
Dec 15, 1978			
Jan 14, 1979			

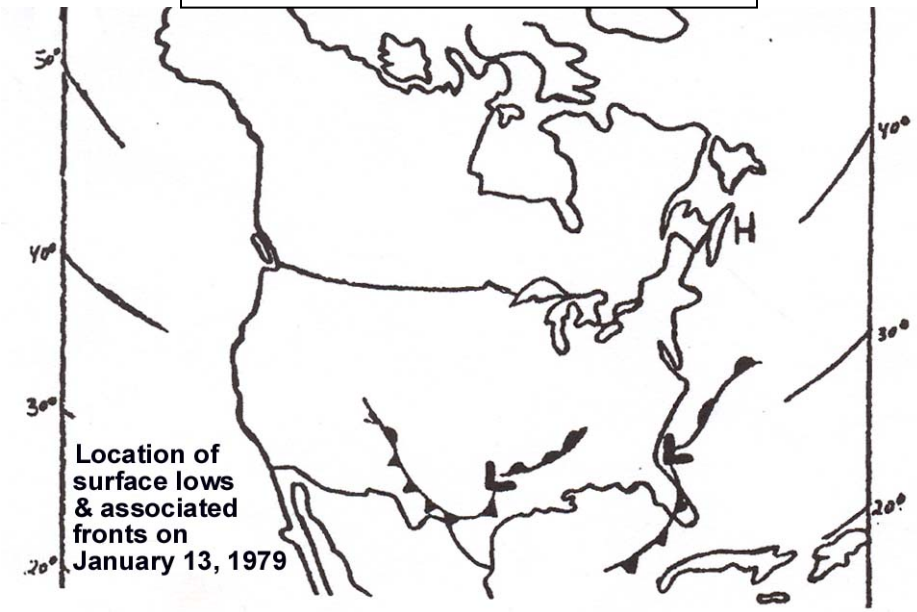
(b) The upper level winds are also "steering mechanisms" for surface weather. Look at the 3-day 500 mb map sequence for January 13, 14, and 15 of 1979 on the next page and note the small **sketch map** that shows the location of two surface lows on January 13, 1979. Knowing the role of the jet stream and longwave pattern in supporting surface convergence and divergence and surface pressure systems, as well as steering them along, **speculate on where you would expect to find these lows on January 14 and 15? Also speculate on whether you might see any new extratropical cyclone lows being steered into the U.S. on these two day.**

Then **on the sketch map, draw in the movement you would predict for the lows over these two days.** (Sketch in your forecasted location of the lows on the sketch map and any new lows, indicating the date).

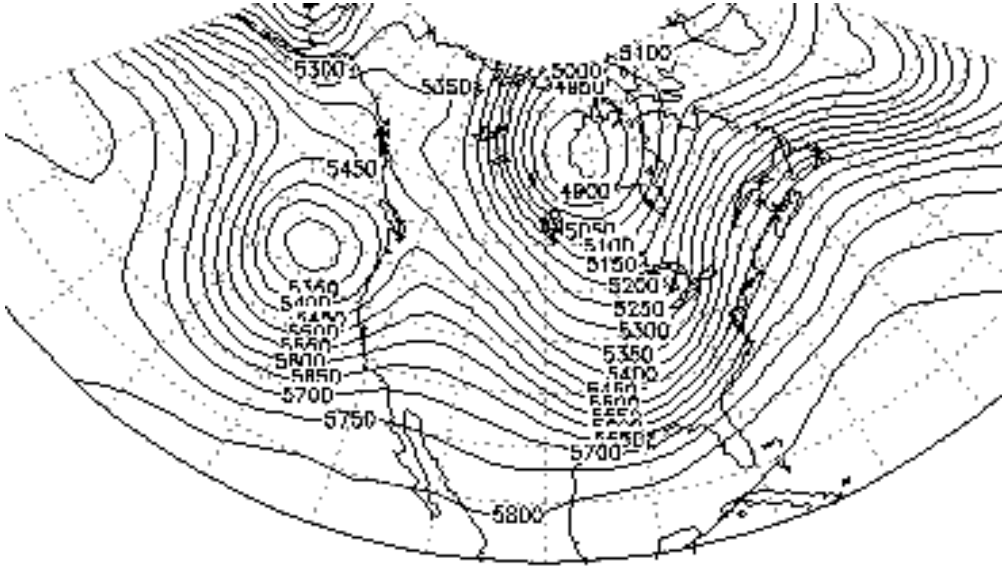
Jan 13, 1979 500 mb ht (m) 12 Z



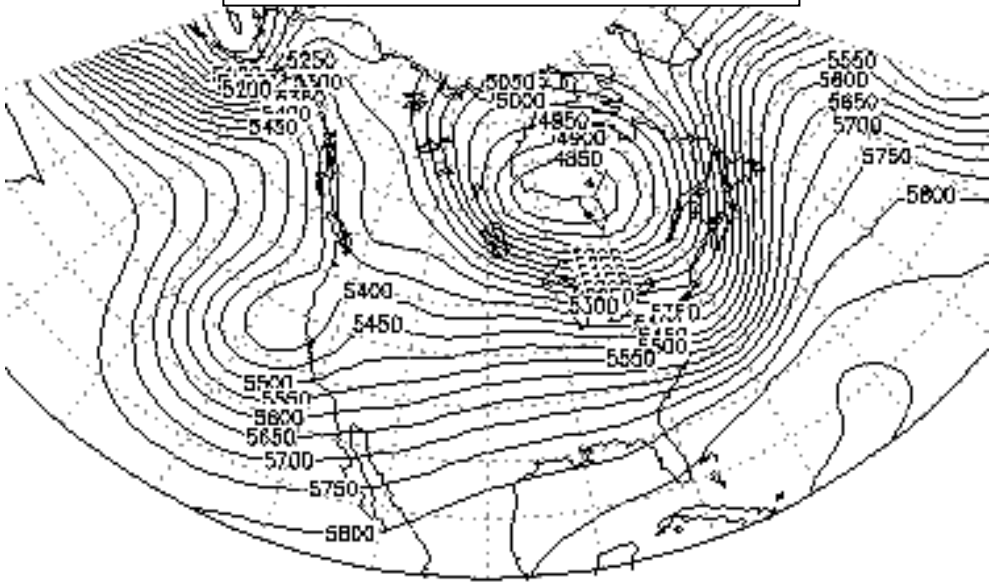
Jan 13, 1979 500 mb ht (m) 12 Z



Jan 14, 1979 500 mb ht (m) 12 Z



Jan 15, 1979 500 mb ht (m) 12 Z



Question #1

On the map below are simplified station records for central United States. On the map below, (a) **draw in isobars** at 4 millibar intervals (generally ranging between 960-1040 mb), (b) **locate the center of the low** pressure system, and (c) **draw in accompanying warm and cold fronts** according to the classic "midlatitude cyclone model."

DRAW IN ISOBARS (lines of equal pressure) for the following values: and LABEL them:
040 (1004.0 mb) 080 (1008.0 mb) 120 (1012.0 mb) 200 (1020.0 mb)

(To get you started, the 160 or 1016.0 mb isobar is already sketched in.)