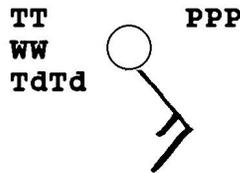


HOMEWORK 5 SURFACE WEATHER MAP ANALYSIS

The first attached map is a plot of the surface weather observations made over the upper Midwest at 6:00 AM CST on Friday, 10 November 1998. The second map is the plot of the sea level pressure for that time. Several isobars have been added to a portion of this chart to help you see the process of making an isobar analysis. You can use this second chart to complete your initial isobar analysis.

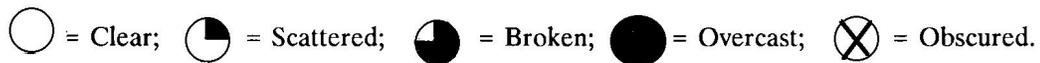
A. STATION MODEL

At each station on the first map the following abbreviated surface station model has been utilized:



where

- TT = air temperature (deg F)
- TdTd = dewpoint temperature (deg F)
- PPP = sea-level corrected pressure (tenths of mb)
(with decimal and lead "9" or "10" missing)
- WW = significant weather or obstruction to visibility (symbol)



Wind arrows fly with the wind. Each full barb equals 10 knot wind speed. [Sample station reports a 15 knot wind *from* the southeast (SE)]. Missing values are indicated by an "M".

What were the conditions reported at Madison, WI at map time? (*Include units*)

Temperature: _____ Dewpoint: _____
 Pressure: _____ Sky cover: _____
 Wind Speed: _____ Wind Direction: _____
 Precipitation type *or* significant weather phenomenon: _____

B. ISOBAR ANALYSIS

Remember that isobars portray the sea-level corrected pressure field. Using the second chart, analyze the sea-level pressure field (on the second map) by drawing *isobars* spaced every 4 mb, centered upon 1000 mb (e.g., ..., 992, 996, 1000, 1004, 1008, ...). The reported values may not necessarily equal the desired values. Therefore, you would have to interpolate between those stations with pressures within ± 4 mb of the desired value. When performing your analysis make a light sketch of the isobars with a pencil initially; then smooth the isobars. Use the include isobars to help you in your analysis. After smoothing and checking your analysis, isobars may then be inked onto the first chart with a *black* pen and each labeled neatly.

Points to consider during your isobar analysis:

1. Where is the low- or high- pressure center(s) located?
 (*Identify the pressure feature and state or province*)

Hint: you should look for the regions with a distinct, closed wind circulation. Locate the center of the low or high pressure system and mark with a large red block "L" (for the low) or a large blue "H" (for the high). Give an estimate of the value of the central pressure for that pressure feature.

2. Since the atmosphere is a continuous fluid, no discontinuities nor sharp kinks should appear in your isobar analysis. The spacing between isobars should suggest a smooth horizontal pressure gradient, if possible. Some kinks in the isobars should be expected, especially near wind shift lines and fronts.

3. The isobars are usually spaced closer in regions where the wind speed is greatest.
4. Does your smoothed analysis conform to the above items? _____

C. ISOTHERM ANALYSIS

Analyze the surface temperature field on the first chart by drawing *isotherms* every 10°F (e.g., 10°, 20°, 30°,...). Some smoothing may be necessary. Attempt to follow the same rules as for drawing isobars noted above; however, the temperature field is usually more variable than the pressure field. The finished isotherm analysis should be drawn in *dashed red* lines and each isotherm should be labeled accordingly.

Points to consider during your isotherm analysis:

1. Where are the *warmest* and *coldest* regions (by state) found?
 - a. Warmest _____ ;
 - b. Coldest _____ .
2. Where are the *sharpest* horizontal temperature contrasts located?

D. INTERPRETATION OF THE SURFACE ANALYSIS

Answer the following questions using your analyzed Midwest map.

1. Where are the regions of highest and lowest dewpoints?
 - a. Highest dewpoint (humid) _____ ;
 - b. Lowest dewpoint (dry) _____ .
2. Describing in words, what type of precipitation is found in:
 - a. Central Illinois _____ ;
 - b. Eastern Nebraska _____ ;
 - c. North central Iowa–Southeast Minnesota _____ .
3. What is the prevailing wind direction that is observed in the following locales?
 - a. North Dakota _____ ;
 - b. Central Illinois _____ .
4. In what region do you find the *strongest* winds on the map?

Are the isobars *closer* or *farther* apart in this area? _____
5. What region(s) is experiencing *warm air advection*, where winds are transporting warm air toward colder regions?

What region(s) is experiencing *cold air advection*, where winds are transporting cold air toward warmer regions?

E.. FRONTAL ANALYSIS

With the aid of your isotherm analysis, the distribution of dewpoint temperatures and the wind field through the regions of distinct wind shifts, can you identify a cold front? A warm front? Using the conventional frontal symbols (see Figure 1.3 on page 4 of your textbook), draw the appropriate surface fronts on your analysis.

Please hand in your finished surface analysis with this worksheet. Print your name on the map.

HOMEWORK #5 PART II. WEATHER SEQUENCES & FRONTAL PASSAGES

Please print carefully and clearly! For each of the weather elements listed, describe the time sequence that you would expect to observe at your "weather station" during the following three situations:

1. A **warm frontal passage** in autumn resulting when an idealized cyclone passes from south to north, while staying west of you:

	PRE-FRONTAL*	FRONTAL PASSAGE	POST-FRONTAL
CLOUDS (<i>type</i>)			
PRECIPITATION (<i>type</i>)			
TEMPERATURE (<i>trend</i>)			
WINDS (<i>direction</i>)			
PRESSURE TENDENCY			

2. A **cold frontal passage** in the spring of the year when an idealized cyclone moving eastward passes from the northwest to the northeast of you:

	PRE-FRONTAL	FRONTAL PASSAGE	POST-FRONTAL
CLOUDS (<i>type</i>)			
PRECIPITATION (<i>type</i>)			
TEMPERATURE (<i>trend</i>)			
WINDS (<i>direction</i>)			
PRESSURE TENDENCY			

3. The passage of an idealized snow producing cyclone (and attendant trough line) in winter traveling from southwest to northeast, but remaining just south of you:

	PRE-TROUGH	TROUGH PASSAGE	POST-TROUGH
CLOUDS (<i>type</i>)			
PRECIPITATION (<i>type</i>)			
TEMPERATURE (<i>trend</i>)			
WINDS (<i>direction</i>)			
PRESSURE TENDENCY			

04212/EJH * where "Pre-" indicates several hours before frontal or trough line passage and "Post-" the several hours following frontal or trough line passage.