1 Objectives
• Learn how to analyze pressure and temperature fields and to identify fronts on surface maps.

2 Materials
• The U.S. map plotted from METAR reports in a previous lab and a map plotted for this Sunday
• A pencil, some color pencils, and an eraser

3 Instructions
Your job today is to analyze the pressure and temperature fields of a surface map. This is accomplished by drawing isobars (lines of constant pressure), isotherms (lines of constant temperature) in such a way that they are generally consistent with the individual reports.

1. Look over your surface map and get a general feel for where areas of relatively high and low pressure are located. Mark in pencil the “H”s and “L”s.

2. Try to locate cyclones and fronts on the surface map.

To find the surface cyclone, find a region of lowest sea level pressure and search for the center of cyclonic circulation if there is any.

To find the fronts,
• Find large temperature gradients
• Identify regions of wind shifts
• Look for specific temperature advection (warm/cold)

First, sketch the fronts in pencil, and then later on you may have to shift their locations as you continue in analyzing the pressure and temperature field.

3. Lightly sketch in the isobars for each pressure value, which is a multiple of 4mb (e.g., 1012, 1016, 1020, etc.) in solid lines with pencil. If the lines in multiple of 4mb look too far apart from each other, sketch in the in between isobars that is in multiple of 2mb (e.g. 1014, 1018, etc) in dashed lines.

4. When you are finished sketching them in roughly, neaten them up by getting rid of wild kinks, smoothing them out, and making sure that the spacing between adjacent isobars is reasonably even. Note that there are often minor errors in station reports, so you may sometimes find it necessary to leave a report on the “wrong” side of your smoothed isobars.

The following checklist should be used to evaluate the correctness of your isobars:
• Almost all reports lying between two isobars of different values should report pressures between those two values. Those that lie closest to one of the isobars should have values close to the isobar value.
• If you follow an isobar along its path, the area of higher pressure should always be on one side, lower pressure on the other.
• The spacing between isobars is usually inversely proportional to the wind speed, so they
should be closer together in windy areas.

- Isobars of different values never cross or touch each other.
- In non-mountainous areas in the Northern Hemisphere, wind generally Leaves Low pressure on the Left. That is to say, wind indicators should show general counterclockwise flow around lows and clockwise flow around highs. In addition, there will usually be some component of flow from across isobars, from high to low pressure. This rule can sometimes help you to decide how to draw your isobars in regions of sparse or inconsistent reports.
- Isobars are usually free of sharp kinks or loops, except in the vicinity of a front, or around the immediate center of a low pressure regions.
- So, remember to kink the isobars across the fronts.
- Isobars tend to be consistent with troughs and ridges. Try to plot the isobars in such a way that the troughs and ridges all happen in the same direction as you go from high to low / low to high pressure.

5. Sketch in the isotherms with pencil in a multiple of 2 degrees Celsius or 4 degrees Fahrenheit. Adjust the location of the fronts if you need to. For example, the cold front should be just right ahead of the region of strong temperature gradient (closely packed isotherms). Adjust the isobars too so that the isobars and isotherms all agree with each other on the same location of the front.

6. After you are certain of the location of the fronts, isobars, and isotherms, you may now darken the isobars in pencil/black, the isotherms in red, and the fronts with their colors and symbols accordingly (see the last page of handout). The isobars and the isotherms should be labeled.

7. Mark the maxima and the minima in the pressure field in “H” in blue and “L” in red. Label the value of the “H” and “L” as well underneath the symbol.

8. Lastly, locate and shade the precipitating areas in green and areas with fog / mist in yellow.