AOS 330
Skew-T Log-p diagram
familiarization

1 Objectives

Become familiar with the layout of the most commonly used atmospheric thermodynamic diagram.

2 Materials Needed

- Skew-T diagram
- pencil and eraser (use pen only if you don't make mistakes!)
- straightedge

3 Introduction

The skew-T diagram is widely used by meteorologists for plotting atmospheric profiles of temperature and humidity. It is remarkably versatile for converting between temperature and moisture variables, for predicting the properties of rising and sinking air parcels, and for assessing atmospheric stability and the threat of thunderstorms and severe weather, among many other tasks.
The skew-T diagram looks very complicated but is really rather straightforward, once you get used to looking at it. It has five families of lines on it, each with its own set of meanings and uses. Our first priority in this exercise is that you learn to recognize and use these lines for basic plotting.
We will use a compact version of the skew-T diagram that fits on a standard sheet of paper. The "official" charts are quite large, cumbersome to transport, and fairly expensive.

4 Procedure

Some of the steps in the exercise will be recorded directly on your skew-T chart. Your responses to other tasks should be recorded on a sheet of paper and turned in along with your chart.

1. Record your name somewhere in the lower-right margin of your chart.
2. Carefully read the following descriptions of curves appearing on the chart:

   Isobars - Straight horizontal black lines representing pressure. Labeled in hectopascals.

   Isotherms - Straight diagonal red lines sloping upward toward the right and representing temperature. Labeled in degrees Celsius.

   Dry adiabats - Slightly curved red lines sloping upward toward the left.

   Moist adiabats- Curved green lines. These are also known as "saturation adiabats" or "pseudoadiabats."

   Saturation mixing ratio lines - Dashed blue lines representing constant saturation mixing ratio. Labeled in grams of water vapor per kilogram of dry air.

3. *Find* each of the above five families of lines on the chart. Also find the corresponding numerical labels.
4. Demonstrate your recognition of the different lines by plotting a dot with a small (1/4") circle around at each of the following locations. Label it with the indicated letter. Note that you will have to interpolate between lines in some cases.

- (A) Pressure $p = 1000$ hPa, Temperature $T = 0°\text{C}$.
- (B) $p = 200$ hPa, $T = -70°\text{C}$.
- (C) $p = 1010$ hPa, $T = 30°\text{C}$.
- (D) $p = 675$ hPa, saturation mixing ratio $w_s = 14$ g/kg.
- (E) $p = 400$ hPa, saturation mixing ratio $w_s = 0.3$ g/kg.
- From the intersection at $p = 1000$ hPa and $T = 16°\text{C}$, follow the *moist adiabat* up to where it crosses the 300 hPa level, and plot point (F).
- From point (F), follow a path parallel to the nearest *dry adiabats* to the 683 hPa level, and plot point (G).

5. On your sheet of paper, write down the saturation mixing ratio w_s corresponding to points (C) and (F). Include the appropriate units.

6. Write down the temperatures T corresponding to points (D) and (E).

7. Plot the (simplified) temperature trace from yesterday's sounding from Greenbay, WI (below). Do this by first marking circled dots corresponding to the temperatures and connecting these with straight lines using a straightedge. Be careful not to skip any of your dots when connect the lines!

8. Mark any inversions with a vertical arrow between the bounding pressure levels, and the letter 'I'.

9. The tropopause is that point in the sounding where there is an abrupt end to the more or less steady decrease in temperature with height. It is typically (but not always) found between 400 and 100 hPa. If you can, try to visually identify the tropopause from your temperature curve. Mark the level with a 'T'.

10. Write the date/time and location of the sounding in the lower-left corner. Also, convert the date/time to *local* date/time and record on your sheet of paper. Note that Greenwich Mean Time (Z or GMT) is 6 hours ahead of Greenbay during Standard Time and 5 hours ahead during Daylight Savings Time (DST).

Greenbay, WI (GRB) 12Z 09 Sep 2010

PRES hPa	HGHT m	TEMP C	DEWPT C
996.0	214	5.8	5.5
968.0	448	10.2	6.0
925.0	822	8.0	2.0
914.7	914	7.2	1.8
868.0	1344	5.4	0.4
850.0	1516	8.4	-2.6
825.0	1763	8.6	-8.4
804.0	1976	9.4	-24.6
732.5	2743	7.1	-20.6
700.0	3114	5.2	-21.8
654.5	3658	1.8	-21.1
606.5	4267	-0.7	-31.8
500.0	5780	-10.7	-31.7
479.7	6096	-13.2	-34.7
417.0	7152	-20.5	-27.5
400.0	7460	-22.1	-34.1
302.6	9449	-36.3	-50.7
250.0	10750	-46.1	-59.1
223.0	11502	-50.3	-62.3
200.0	12210	-51.1	-64.1
190.0	12544	-51.3	-64.3
150.0	14050	-58.3	-70.3
143.5	14326	-60.6	-72.0
132.0	14842	-63.1	-73.1
105.0	16243	-66.3	-76.3
100.0	16540	-62.7	-72.7