

Cloud Physics Lab

LAB 3: The use of SKEW-T

Purpose:

To demonstrate the use of Skew-T diagram

Theory:

The Skew-T Log-P offers an almost instantaneous snapshot of the atmosphere from the surface to about the 100 millibar level. The advantages and disadvantages of the Skew-T are given below:

Why do we need Skew-T Log-P diagrams?

- Can assess the (in) stability of the atmosphere.
- Can see weather elements at every layer in the atmosphere.
- Determine cap strength, convective temperature, forecasting temperatures.
- determine character of severe weather.
- This is the data used to produce the synoptic scale forecast models.

What are some disadvantages of Skew-T's?

- Only available twice a day (00Z and 12Z).
- Character of weather can change dramatically between soundings.
- Sounding does not give a true vertical dimension since wind blows balloon downstream.
- Sounding does not give true instantaneous measurements since it takes several minutes to travel from the surface to the upper troposphere.

The basics lines that make up the Skew-T are:

Isobars Lines of equal pressure. They run horizontally from left to right and are labeled on the left side of the diagram. Pressure is given in increments of 100 mb and ranges from 1050 to 100 mb. Notice the spacing between isobars increases in the vertical (thus the name Log P).

Isotherms Lines of equal temperature. They run from the southwest to the northeast (thus the name skew) across the diagram and are SOLID. Increment are given for every 10 degrees in units of Celsius. They are labeled at the bottom of the diagram.

Saturation mixing ratio lines Lines of equal mixing ratio (mass of water vapor divided by mass of dry air -- grams per kilogram) These lines run from the southwest to the northeast and are DASHED. They are labeled on the bottom of the diagram.

Wind barbs Wind speed and direction given for each plotted barb. Plotted on the right of the diagram.

Dry adiabatic lapse rate Rate of cooling (10 degrees Celsius per kilometer) of a rising unsaturated parcel of air. These lines slope from the southeast to the northwest and are SOLID. Lines gradually arc to the North with height.

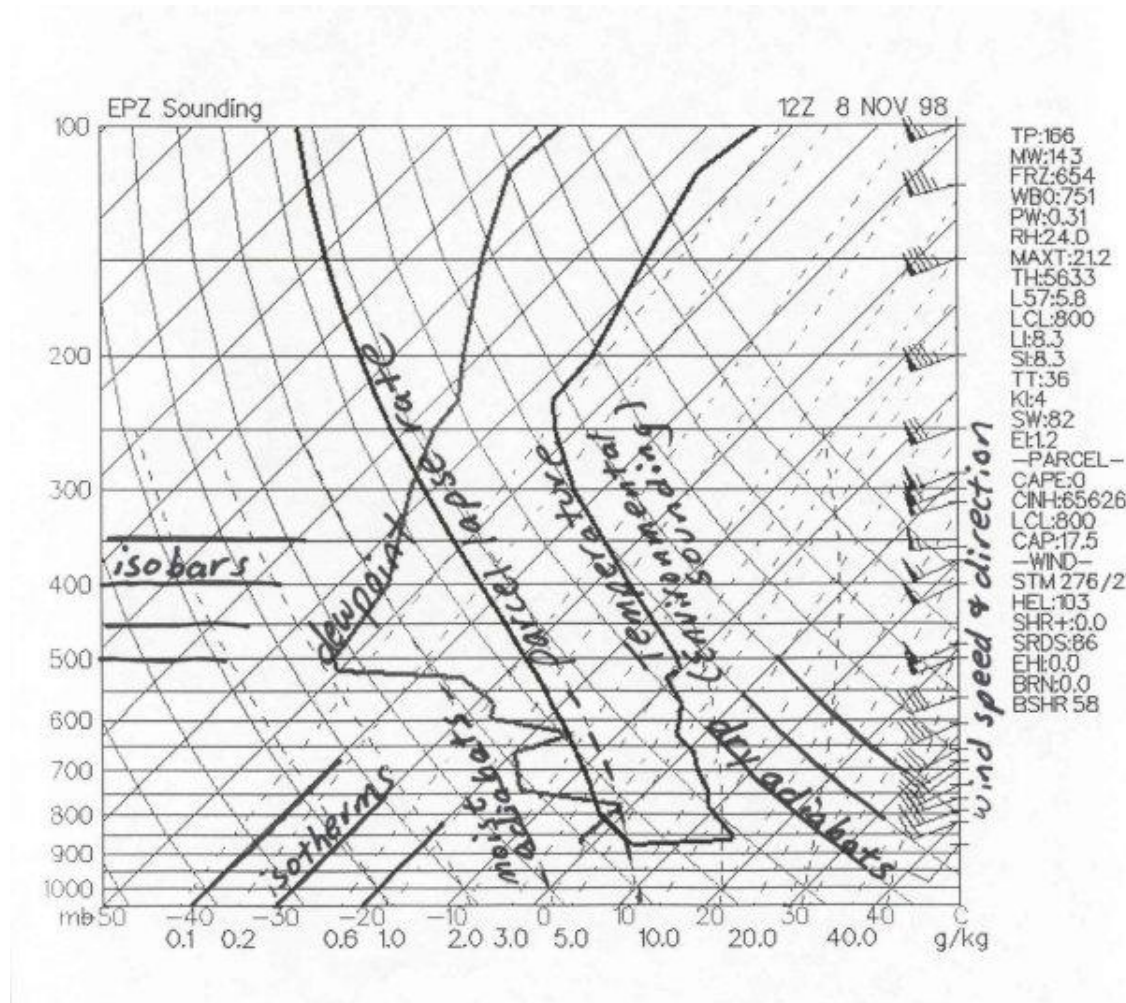
Moist adiabatic lapse rate Rate of cooling (depends on moisture content of air) of a rising saturated parcel of air. These lines slope from the south toward the northwest. The MALR increases with height since cold air has less moisture content than warm air.

Environmental sounding Same as the actual measured temperatures in the atmosphere. This is the jagged line running south to north on the diagram. This line is always to the right of the dewpoint plot.

Dewpoint plot This is the jagged line running south to north. It is the vertical plot of dewpoint temperature. This line is always to the left of the environmental sounding.

Parcel lapse rate The temperature path a parcel would take if raised from the Planetary Boundary Layer. The lapse rate follows the DALR until saturation, then follows the MALR. This line is used to calculate the LI, CAPE, CINH, and other thermodynamic indices.

Below is an example diagram showing the lines of the Skew-T Log-P diagram.



Methodology:

- 1- Use the Matlab script *lab3.m* to plot the sounding for the following input files to determine the lifting condensation level (LCL):

feb4.txt

feb6.txt

feb24.txt

feb27.txt

- 2- Discuss your results.