# MET 3502L/5561L – Synoptic Meteorology Lab

# Lab 1: Skew-T Analysis

Use the attached sounding data from Miami, FL at 00 Z 11 Sep 2007 to answer the following questions:

1. Plot the sounding data on the Skew T, Log P diagram provided. Plot each (T, P) and (Td, P) data pair on the diagram with pencil. Use a straight edge to “connect the dots” for both temperature and dewpoint. When complete, use distinct colors (e.g., red [blue]) pencil/pen to indicate the temperature [dew point] profile. **In addition, please plot winds on the right side at mandatory levels (1000, 925, 850, 700, 500, 400, 300, 250, 200, 150, and 100 hPa).** Hint: A wind staff pointing in the direction from which the winds are coming from shows wind direction. A North wind is from 360 ° or 0 °, and East wind is from 90 °, a South wind is from 180 °, and a West wind is from 270 °. (20 points)

1. Find mixing ratio, saturation mixing ratio, relative humidity, potential temperature, equivalent temperature, and equivalent potential temperature at 700 mb and 500mb, respectively. Please don’t forget units. (12 points)

## Enter your answers below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| level | Mixing ratio | Saturation mixing ratio | Relative humidity | Potential temperature | Equivalent temperature | Equivalent potential temperature |
| 700mb |  |  |  |  |  |  |
| 500mb |  |  |  |  |  |  |

*3. Lifting Condensation Level (LCL)*

a. In your own words, define the lifting condensation level (LCL) *(3 points)*.

b. Find the LCL by lifting a parcel from the surface and label it on your diagram *(2 points)*. Describe your procedure in words *(3 points)*. What is the pressure (mb) and temperature (°C) of the LCL? *(4 points)*

**Answer:**

4. *Level of Free Convection (LFC)*

a. In your own words, define the level of free convection (LFC). *(3 points)*

b. Find the LFC using a lifted surface parcel and label it on your diagram *(2 points)*. Describe your procedure in words *(3 points)*. What is the pressure (mb) and temperature (°C) of the LFC? *(4 points)*

**Answer:**

*5. Equilibrium Level (EL)*

a. In your own words, define the equilibrium level (EL). (3 points)

b. Find the EL and label it on your diagram (2 points). Describe your procedure in words (3 points). What is the pressure (mb) and temperature (°C) of the EL? (4 points)

**Answer:**

1. *Environmental Lapse Rate (*Γ*)*. The environmental or temperature (T) lapse rate (Γ) is the decrease of temperature with height (z) where T is measured from a radiosonde and plotted as above. Mathematically, Γ = -dT/dz. The dry adiabatic lapse rate (Γd) is 9.8°C km-1 and is indicated by dry adiabats on the skew T. The moist adiabatic lapse rate (Γm) depends on the amount of moisture present and typically varies from 3-7°C km-1 in the lower troposphere and is shown by moist adiabats on the Skew T, Log P diagram. From the given Miami sounding data, calculate the environmental lapse rate (Γ, °C km-1) in the 700 mb to 500 mb layer. *(10 points)*

**Answer:**

*7. “Positive Area” and CAPE (Convective Available Potential Energy)*

a. In your own words, define the CAPE *(4 points)*.

b. Identify, highlight (with hatching), and label the positive area on the diagram for a lifted surface-parcel. Describe your procedure *(4 points)*.

**Answer:**

*8. Convection Condensation Level (CCL)*

a. In your own words, define the convection condensation level (CCL) *(2 points)*.

b. Find the CCL and label it on your diagram*(2 points)*. Describe your procedure in words *(2 points)*. What is the pressure (mb) and temperature (oC) of the CCL *(4 points)*?

c. Describe what is the convective temperature (Tc) in your own words and estimate it (°C) from your diagram.*(4 points)*

**Answer:**