Lab 6. Lifting a Parcel

Purpose

You will understand how we know if the troposphere in sone region si prone to convective mixing.

Overview

You will plot the temperature and humidity characteristics of an air column measure by a sensor array carried by a weather balloon. On the same axes, you will also plot the theoretical temperature of a parcel originating near the surface raised through the air column.

Materials

Printout of rawinsonde data, blank Stüve plot paper, colored pencils, eraser, ruler

Procedure

1. Receive your printout of the data from the launch of a rawinsonde. Follow the printed instructions for making the Stüve plot. Write your name on your plot.

   Name and location of the station of origin of the rawinsonde whose data you plotted:

   _____

   Date and UTC time of the observations: _____

2. Have a classmate check your Stüve plot, and check a classmate's Stüve plot. Check that the environmental temperature and dew point plots match the numerical data, and check that the theoretical lifting of the surface parcel was done correctly.

   Name and signature of classmate who checked your plot:

   _____

   Name and signature of classmate whose plot you checked:

   _____

   Name and location of station of origin, date, and time of the rawinsonde data whose plot you checked:

   _____

3. Answer the questions below about your plot, and about another plot.

Questions

Answer the same questions about your rawinsonde plot and one of the plots you checked.

Your plot

Time and location: _____

1. Did the sonde reach the tropopause? _____
2. What is the evidence for your answer to Question 1?

3. Does the wind change speed or direction with altitude? If yes, in what manner?

4. Does the air column have a temperature inversion near the surface? _____
5. Are there any altitude ranges in which the temperature is at the dew point? If so, where?

6. What does this tell you about the air column?

7. Are there any altitude ranges through which the measured temperature follows the Dry Adiabatic Lapse Rate? If so, where?

8. Are there any altitude ranges through which the measured temperature follows the Saturated Adiabatic Lapse Rate? If so, where?

9. What do the answers to questions 7 and 8 tell you about the air column?

10. Compare the measured temperature profile to the temperature of the theoretically lifted surface parcel. Describe their relationship throughout the height of the column.

11. According to the Stüve plot generated from the plot, what is the lifted index?

12. How does this compare to the lifted index computed automatically?

Other plot

Time and location: _____

1. Did the sonde reach the tropopause? _____
2. What is the evidence for your answer to Question 1?

3. Does the wind change speed or direction with altitude? If yes, in what manner?

4. Does the air column have a temperature inversion near the surface? _____
5. Are there any altitude ranges in which the temperature is at the dew point? If so, where?

6. What does this tell you about the air column?

7. Are there any altitude ranges through which the measured temperature follows the Dry Adiabatic Lapse Rate? If so, where?

8. Are there any altitude ranges through which the measured temperature follows the Saturated Adiabatic Lapse Rate? If so, where?

9. What do the answers to questions 7 and 8 tell you about the air column?

10. Compare the measured temperature profile to the temperature of the theoretically lifted surface parcel. Describe their relationship throughout the height of the column.

11. According to the Stüve plot generated from the plot, what is the lifted index?

12. How does this compare to the lifted index computed automatically?

Scoring

Plots:

Temperature and dew point plots	6
Lifting at dry adiabatic lapse rate	2
Lifting the dew point	1
Lifting at saturated adiabatic lapse rate	2
Checking classmates' plot	1
Your plot checked by classmate	1

Answers to questions 12