BRIAN CACCHIOTTI
LAB ANSWERS

Lab 2 Exercise

Name: _____

Introduction to the Atmosphere

Lab Section: _____

Please show your work. If necessary please use additional paper to show work.

Weather versus Climate

You will be using several Internet sources to answer the questions below.

- For current conditions, go to http://www.wunderground.com. In the search box (upper right-hand corner), type in KMASALEM17. This is the identifier for the SSU's weather station located on Central campus.

- Because SSU's weather station has only existed for a few years, a station with a longer period of record should be used to examine climate. The closest observing site with the longest climate record is Logan International Airport in Boston. This is where the official observations are recorded for the city of Boston, including temperature and precipitation. To find this information, you will enter KBOS in the search area of Wunderground. Scroll down to the "Almanac" and click on the date. This will bring you to the information including averages and records for the current date. You can also change to any other date from this page.

1. Fill in the following information on the current conditions in Salem including the proper units.

Date/time	January 31, 2018 @ 6:01 am
T	16°f
T_d	7°f
RH	58%
Wind speed/dir	W 10 - 15 MPH
P	0"
Clouds:	Clear
Current weather	Mostly Sunny

2. Weather also includes the recent past and near future. Find the following information regarding the maximum and minimum temperatures as well as precipitation information.

	Date	Min T	Max T	Precip.
Yesterday	1/30/18	20°f	31°f	0.23"
Today	1/31/18	19	21	0
Tomorrow	2/1/18	30	44	0.02

3. For yesterday, today and tomorrow, using the directions above, find the following climate information (for Boston).

	Yesterday		Today		Tomorrow	
	Average	Record	Average	Record	Average	Record
Min T	22	-5	23	-8	23	-7
Max T	36	63	36	62	36	66
Precip	.10	1.01	.11	1.02	.11	1.14

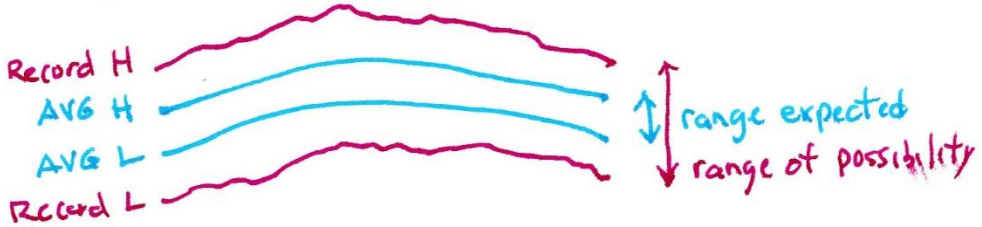
4. How do the weather conditions for yesterday, today, and tomorrow compare with the climate information (averages and records)? For instance, is the maximum temperature above, near, or below average? Are there any records that are close to or being broken? Are there any extreme events taking place in the area (to see a map with current NWS advisories visit: http://www.weather.gov). Write a paragraph summarizing your findings and highlighting the differences between weather and climate.

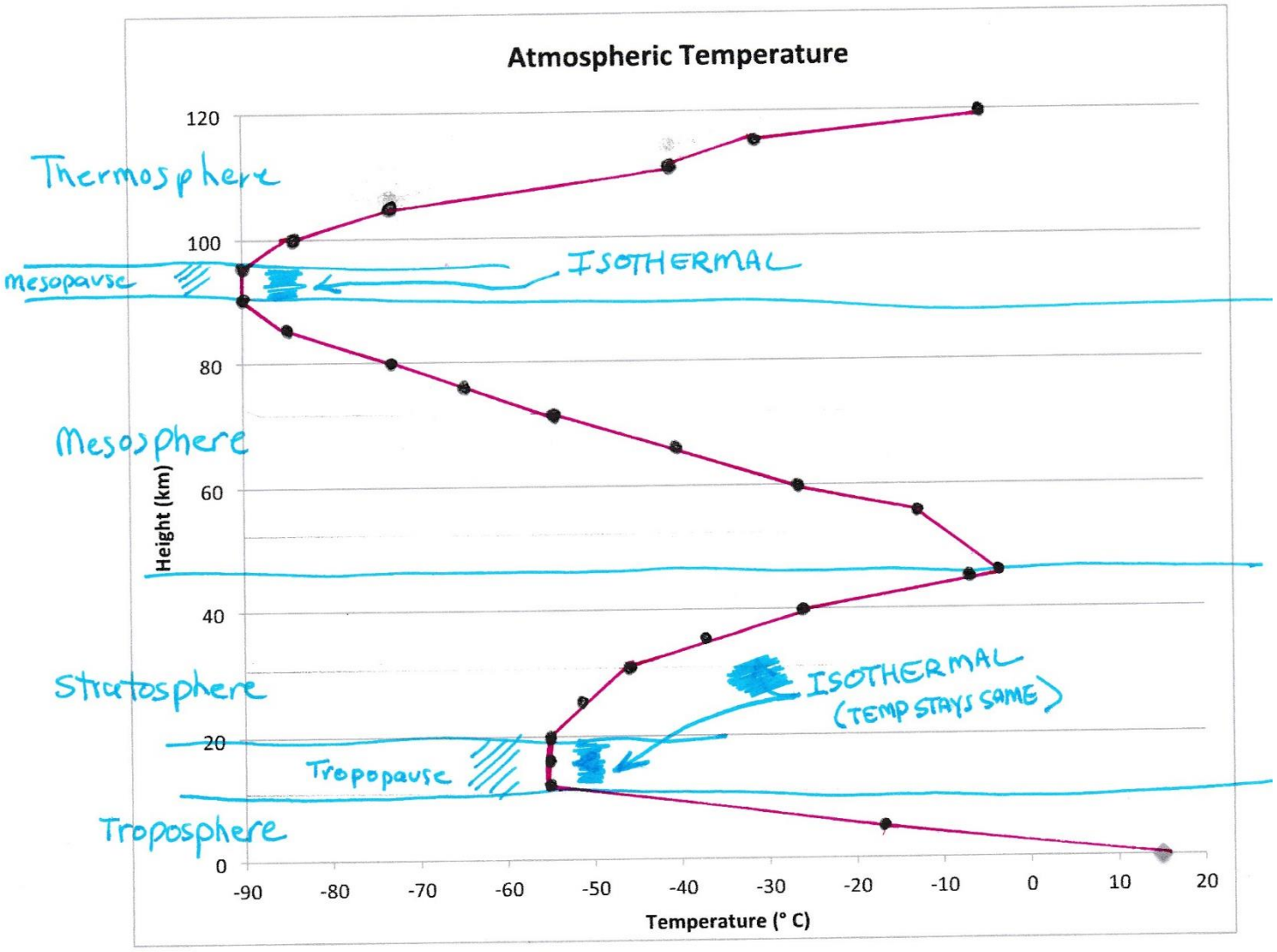
1/30 similar to Averages, but well away from Records
1/31 cooler than Average but still not close to Records
2/1 much warmer than average but still not close to records

Climate is the past weather conditions average for a certain place and date. This is the past informing the future, since longterm patterns exist in weather. Weather is the day to day fluctuations within the atmosphere. A snap shot of current atmospheric conditions.

5. Why might it be important to have information about extreme events and records become a part of the climate record for a location? Explain.

The average data help to understand where the midpoint of the past observations lie, but the extremes allow you to see the entire range of actual possibilities for that place and date





10. Based on the data provided, calculate the lapse rate for the troposphere. Recall the lapse rate is the decrease in temperature with altitude. Follow the instructions below.

a. Find the total temperature change from the surface to the tropopause:

11km — -56.5°

0 — 15°

15 − -56.5 = 71.5°

_____

b. Find the total distance from the surface to the tropopause:

11km

0

11 km

_____

c. Divide your answer from (a) by (b). This is your lapse rate in °C/km.

$\frac{71.5^\circ}{11\,km} = 6.5^\circ/km$

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11. The lapse rate can be used to estimate temperatures above the surface in the troposphere. Suppose today you decide to take a trip from Salem to Mt. Washington in New Hampshire. Based on the current temperature in Salem, you could predict what the temperature at the top of the mountain will be. The elevation of Mt. Washington is 6289 ft (1917 m). Using the current temperature in Salem and the lapse rate, what would be the temperature on the top of Mt. Washington? Salem has an elevation of 26 ft (8 m). Hint: make sure to keep an eye on your units where °C = (°F-32)/1.8.

Current Salem = 16°F → -8.9°c

Lapse rate = 6.5°c / 1 km

1 Kilometer = 1000 meters

MT. WASHINGTON ELEVATION 1917m

Salem Elevation 8m

1917 − 8 = 1909m

$\frac{6.5^\circ}{1000\,m} \times 1909\,m = 12.41^\circ c$

We are moving up, therefore we will get 12.41° COLDER

$-8.9^\circ - 12.41^\circ = -21.31^\circ$

12. Visit www.mountwashington.org. What is the current temperature at the summit of Mt. Washington? Compare this to your answer for 11 above. What might be a reason for any differences between these two values?

Current Mt. Washington Temp = -11°F → -23.89°c

The difference was just over 2°c. Considering that we used a devised ELR from limited data this is quite close. Also Mt. Washington is more that 150 miles North of SSU, and thus is would be expected to be colder than Salem regardless of the elevation.

Experiment: Troposphere Simulation

Using common household items, you will create your very own mini-troposphere in a cup.

Materials

- Two 12 ounce clear plastic cups
- Room temperature water
- Ice
- Food coloring

Step 1

Fill each cup with room temperature water about ¾ of the way full. Let the water sit in the cups undisturbed for 5 minutes.