Fronts

WHAT YOU SHOULD LEARN IN THIS EXERCISE:

- How to identify a cold front and a warm front on a station model map.
- Common characteristics of a cold front and a warm front as seen in the station model data

WHAT YOU NEED TO DO IN THE COMPUTER LAB:

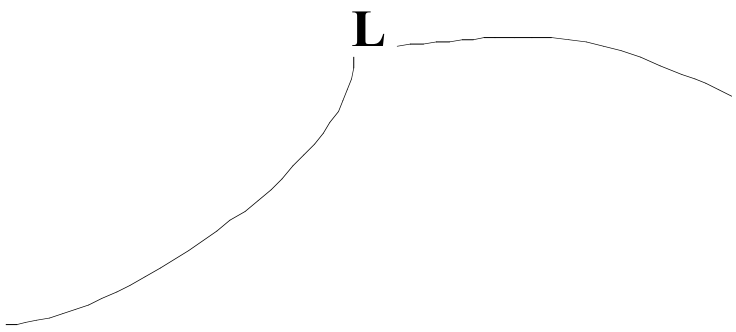
PART A: Background on Fronts

Today we will examine cold fronts and warm fronts and eventually analyze a surface map. Your TA will provide you with background information on fronts, complete the following task with that information (you can work on it as you are given the information.

A1. The diagram below shows a low-pressure center and two lines representing fronts. One is a cold front and one is a warm front. Draw in the appropriate frontal symbols on the lines.

A2. Label the following on the appropriate location on the diagram: cold air, cool air, warm air, moist air, dry air

A3. Draw in 4 to 6 arrows indicating the wind speed around the low.



Part B: Finding Fronts on a Surface Map

When you are analyzing a surface map, to identify a front look for:

(1) a pressure trough
(2) sharp changes in temperature
(3) discontinuities in vapor content of air
(4) shift in wind direction
(5) pressure changes
(6) regions of precipitation

B1. Launch the computer application:
→ Open the class web page on Blackboard
→ Go to "External Links" and choose "Hands-On Meteorology Exercises"
→ Under the ATMOS 100 button, choose the link to the "Fronts" program

B2. *You will need to save the analysis you create. You should save the map to the desktop and then copy it to your CD or email it to yourself.*

B3. There is one low pressure center on the map. Location the center of the low. Choose "Low Pressure Symbol" from the pull down menu. An "L" will appear in the bottom right corner of the map. Drag the L to the location of lowest pressure.

B4. There is one cold front and one warm front on the map. Identify the location of each front and draw in a line indicating each fronts position. Use the pull down menu to choose the appropriate color for the front.

B5. Save the map you just analyzed. Copy it to your CD or email it to yourself. You will need to turn it in with the extended exercise.

Extended Exercise #4:
Due at the beginning of Hands-On class October 31/November 1

WHAT YOU NEED TO TURN IN:
Please organize the following materials in the order they are listed, staple, and turn in.

- Cover page with your name, the date, title of exercise: "Fronts," and your section number and instructor
- The map you analyzed in part B
- The completed tables found on page 5 and either page 6 or 7
- The answers for questions 1, 2 and 3 or 4 (details below)

Note: Your answers should be typed. This will provide you with a backup copy of your assignment and prevent any misinterpretation by the TA grading the assignment.

PART C: QUESTIONS FOR THOUGHT

Important:

- You will answer three of the following four questions. Answer questions 1 and 2 and choose between questions 3 and 4. If you answer both 3 and 4, only the first one will be graded.
- All maps and plots needed for questions 1, 2 and 3 can be found in the class website under "Course Documents | Extended Exercise and in-class exercises (Solutions, Images, etc)"
- The tables for the questions are attached at the end for your convenience. Use these to hand in with your extended exercise write-up.

1. Front analysis

(a) Print the map you analyzed the fronts on.

(b) Draw in the frontal symbols for the cold and warm fronts. *Use the correct color*.

(c) Examine the conditions in the vicinity of the cold front. Fill in the table found on page 5 by identifying the range of values for each, (e.g., temperature 52 – 57, or mid-50s).

(d) What direction is the cold front aligned? (e.g., north-south, northwest-southeast, etc.)

(e) Does the temperature change as you cross the cold front (ahead to behind)? If so, how?

(f) Examine the conditions in the vicinity of the warm front. Fill in the table found on page 5 by identifying the range of values for each, (e.g., temperature 52 – 57, or mid-50s).

(g) What direction is the warm front aligned? (e.g., north-south, northwest-southeast, etc.)

(h) Does the temperature change as you cross the warm front (ahead to behind)? If so, how?

2. Air masses

Go to the class web site and access the temperature and dewpoint maps. Examine the maps and identify the three major air masses on the maps. Fill in the table found on page 5 of this exercise with the following information:

- Location: region of North America where the air mass is located (example: Southeastern US, Central Canada, Midwest US).
- Classification: airmass classification abbreviation (example: mT – maritime tropical)
- Characteristics: airmass characteristics in terms of temperature and moisture (example: warm (T in the 90s), humid (Td in the 60s and 70s)). Consider temperature and dew point temperature to be high if >50°F and low if <50°F.

Answer one of the following two questions:

3. Upper air maps

This question will familiarize you with upper air maps. Upper air maps are created twice a day, corresponding to the times that upper air data is available from radiosondes (weather balloons). Radiosondes are launched at approximately 75 locations across the U.S. These locations are referred to as "upper air stations." The data is then plotted on a constant pressure chart to illustrate the conditions across the U.S. at that particular pressure level.

(a) Go to the class web site and print a copy of the upper air map found under extended exercise #4.
(b) Decode the 300 mb report for the station at Glasgow, Montana, using correct units and fill in the table found on page 6 of this exercise. Appendix C of your textbook gives instructions for decoding upper air station models. (The 300 mb station model format is the same as the 500 mb station model format given in the Appendix.)
(c) Draw the 70 kt, 85 kt and 100 kt wind speed contours.
(d) Draw a line to denote the jet stream(s) axis.

4. Scales of motion

A blank table is found on page 7 that lists various types of atmospheric phenomenon. Fill in the table using the guidelines below.

- Scale of motion, choose the spatial scale (global, synoptic, mesoscale, microscale).
- Size range, use powers of 10 of kilometers (km) and meters (m) (few meters, 10s of m, 10s of km, 100s of km, or 1000s of km).
- Typical duration, indicate the range of temporal scale (months, weeks, days, hours, minutes, seconds or some combination).

1(a). Cold front

	Ahead of the cold front	Along the cold front	Behind the cold front
Temperature			
Dewpoint			
Wind speed			
Wind direction			
Cloud cover			
Significant weather			

1(d). Warm front

	Ahead of the warm front	Along the warm front	Behind the warm front
Temperature			
Dewpoint			
Wind speed			
Wind direction			
Cloud cover			
Significant weather			

2. Air masses

	Location	***Classification***	***Characteristics***
Air mass 1			
Air mass 2			
Air mass 3			

3. Upper air maps

Temp.	*Dew point depression*	*Dew point*	*Height*	*Pressure*	*Wind speed*	*Wind Direction*

4. Scales of motion

Phenomena	*Scale of Motion*	*Size range*	*Typical Duration*
Anticyclone			
Cold front			
Hurricane			
Jet stream			
Lake effect snowstorm			
Mid-latitude cyclone			
Monsoon			
Thunderstorm			
Swirl of leaves			