

Weather NOTES

OBJECTIVES

Correctly define: air mass, air pressure, anemometer, barometer, cyclone, dew point, front, isobar, isotherm, meteorology, precipitation, psychrometer, relative humidity, saturated, transpiration

WEATHER BASICS:

- Explain where the energy for Earth's weather originates.
- Describe the basic direction all weather moves in the United States.

STATION MODELS:

- Locate and decode information from a weather station model.
- Label a weather station model based on provided data in the correct formats.

MOISTURE:

- Name three factors which affect the rate of evaporation.
- Name the natural process which cleans the atmosphere.
- Draw and describe the process by which clouds form.
- Explain under what conditions clouds are most likely to form.
- Explain the relationship between air temperature and its ability to hold water.
- Identify the instrument used to measure relative humidity and dew point.
- Use the charts on page 12 of the ESRTs to calculate relative humidity and dew point.
- Describe the relationship between relative humidity and temperature.
- Explain the relationship between dew point and air moisture.
- Explain the relationship between relative humidity and moisture content.
- Explain how the probability of precipitation changes as dew point and temperature change.

PRESSURE AND WIND:

- Explain how wind is named.
- Describe what causes the general movement of wind and its direction.
- Describe the relationship between air pressure and density
- Describe whether air is sinking or rising based on its pressure.
- Describe the relationship between moisture content and air pressure.
- Identify the characteristics of high and low pressure centers.
- Draw the direction of wind flow around high and low pressure centers.
- Draw an isobar map based on provided data.
- Describe the relationship between altitude and air pressure.
- Describe the relationship between air pressure gradient and wind speed.
- Identify how land and sea breezes are formed.
- Explain the relationship between winds and waves.
- Describe why planetary winds curve.
- Use the chart on page 14 of the ESRTs to state the prevailing wind direction for any latitude.
- Use the chart on page 13 of the ESRTs to convert barometric pressure from millibars to inches of mercury.

AIR MASSES AND FRONTS:

- Explain how air masses get their properties.
- Identify the temperature and moisture content of air masses based on their abbreviations.
- Identify where an air mass would likely form based on its characteristics.
- Draw an isotherm map based on provided data.
- Identify a warm or cold front on a weather map.
- Draw a profile showing how a cold or warm front looks on the ground.
- Identify the key characteristics associated with cold and warm fronts.
- Draw warm and cold fronts on a weather map based on air mass characteristics.

HAZARDOUS WEATHER AND SAFETY:

- Identify other names for hurricanes and tornadoes.
- Describe the type of weather and dangers associated with hurricanes and tornadoes.
- Describe hurricanes and tornadoes are different regarding geographical scale.
- Describe appropriate safety precautions to take for both tornadoes and hurricanes.

Vocabulary

Air Mass:

Air Pressure:

Anemometer:

Barometer:

Cyclone:

Dew Point:

Front:

Isobar:

Isotherm:

Meteorology:

Precipitation:

Psychrometer:

Relative Humidity:

Saturated:

Transpiration:

Key Concepts & Questions

Weather Basics

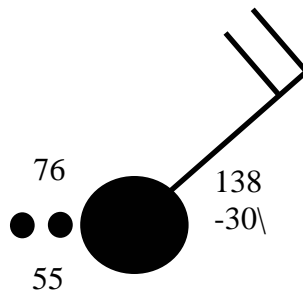
Where does the energy for weather originate? the uneven heating of the Earth's surface

In the United States, the general direction that weather systems move is toward the Northeast (NE).

Station Models

What page of the ESRTs has the key to decode the station model? 13

The temperature and dewpoint are measured in degrees °F.



Using the station model above, fill in the chart below using the decoding information from the ESRTs:

Temperature	Dew Point	% Cloud Cover	Air Pressure	Barometric Trend	Wind Direction	Wind Speed
76	55	100	1013.8	-3.0	NE	20

NOTES:

To find the air pressure, you must add a decimal place between the last two digits. Then add a 9 or 10 in front of the number so that it fits on the pressure scale on page 13 of the ESRTs. In this example, you would have 13.8. 913.8 doesn't fit on the scale, but 1013.8 does, and this would be the pressure.

To find the barometric trend, you must add a decimal place between the two digits.

These numbers must be converted!
Do NOT simply write the numbers above.

MOISTURE

➤ Evaporation: Three factors which affect:

a. Temperature How does it affect evaporation? What's the relationship?

As temperature increases, the rate of evaporation increases. Direct relationship

b. Surface Area How does it affect evaporation? What's the relationship?

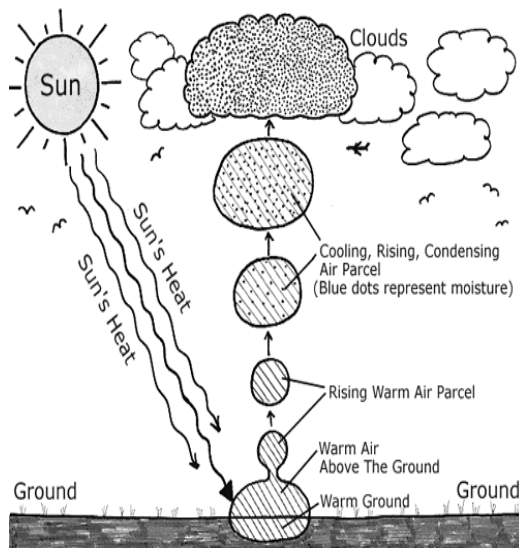
As surface area increases, the rate of evaporation increases. Direct relationship

c. Relative Humidity How does it affect evaporation? What's the relationship?

As relative humidity increases, the rate of evaporation decreases. Indirect relationship

WHAT NATURAL PROCESS CLEANS THE ATMOSPHERE? PRECIPITATION

DRAW AND DESCRIBE THE PROCESS BY WHICH CLOUDS FORM.



Cools to the
dewpoint
↑
Expands
↑
Warm
Air Rises

CLOUDS ARE MOST LIKELY TO FORM WHEN:

- THE AIR IS (**SATURATED**, UNSATURATED) AND (**RISING**, SINKING)
- THE TEMPERATURE IS AT THE DEWPOINT
- CONDENSATION NUCLEI ARE AVAILABLE FOR WATER TO CONDENSE ON

MOISTURE (CONTINUED)

AS THE AIR TEMPERATURE INCREASES. THE AIR CAN HOLD (LESS, **MORE**) WATER.

What instrument is used to measure relative humidity and dew point? Draw a diagram of what the instrument looks like and explain how it works.

a sling Psychrometer is used to measure relative humidity and dew point



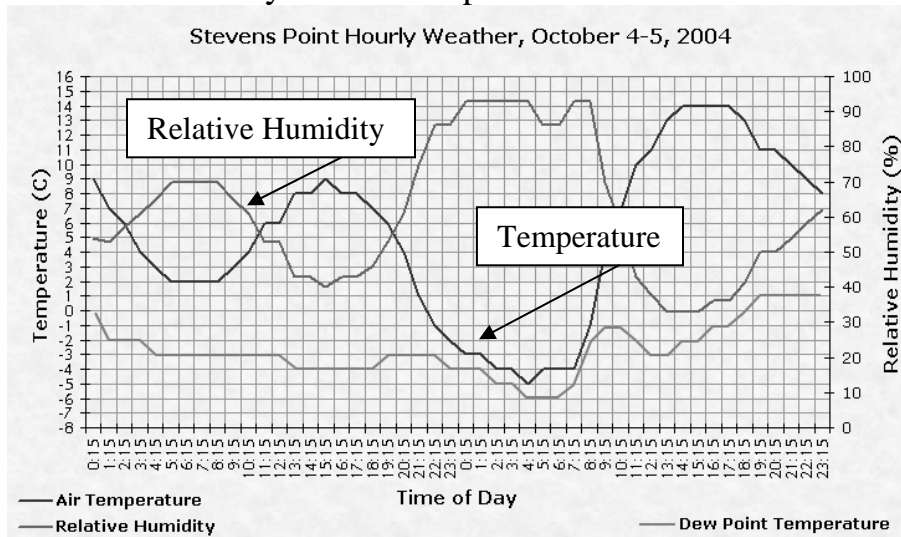
The wet bulb has a cotton “sock” wrapped around it that is wet. As the Psychrometer is swung around the water evaporates and the temperature decreases until no more water can evaporate.

The difference in temperature between the dry-bulb and wet-bulb is used to determine the relative humidity and dewpoint.

Using the charts on page 12 of the ESRTs, calculate the relative humidity and dew point using the following information.

Dry Bulb	Wet Bulb	Difference	Dew Point	Relative Humidity (%)
14	10	4	6	60
20	15	5	12	58
30	23	7	19	55
18	13	5	9	56

Relative Humidity vs Air Temperature

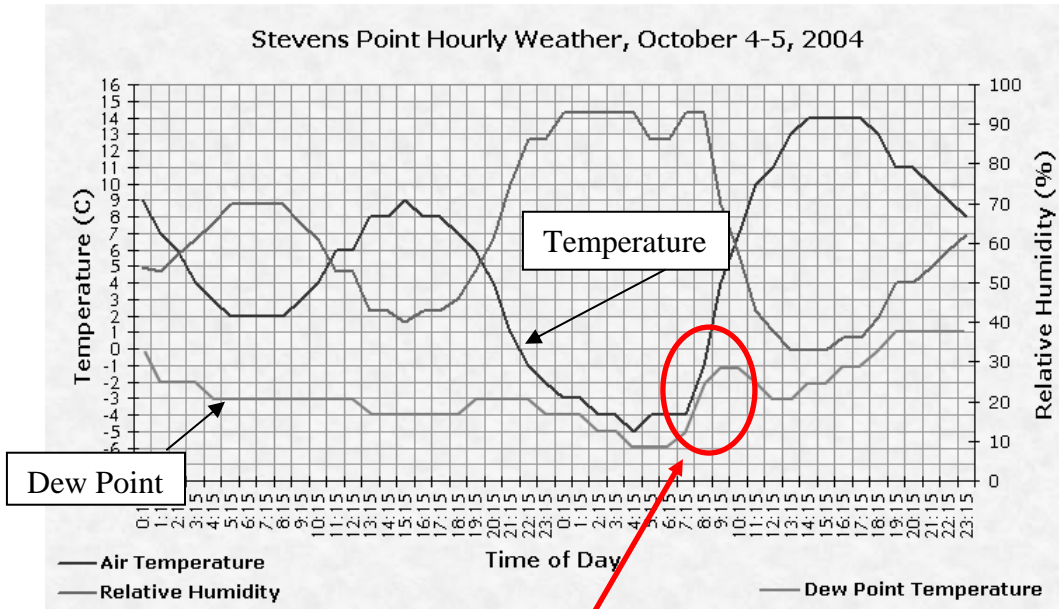


Based on the diagram above, what is the relationship between air temperature and relative humidity?
as the temperature goes up, the relative humidity goes down. An indirect relationship.

MOISTURE (CONTINUED)

Dew point is a direct measure of the moisture content of the air. Therefore, as the dew point temperature increases, the amount of moisture in the air increases

As the air temperature and dew point get closer together, the probability of precipitation increases



Pressure and Wind

What instrument is used to measure wind speed? anemometer Air pressure? barometer

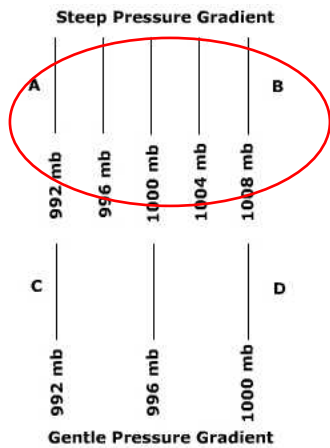
How are winds named?

from the direction from which they come. (A “north wind” comes from the north)

What causes wind?

differences in air pressure

Which pressure gradient would result in greater wind velocity?

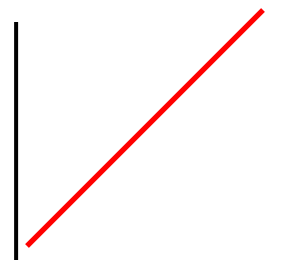


Convert the following measurements using the chart on page 13 of the ESRTs.

mb	Inches of Mercury
1007	29.73
997	29.44
1022	30.18
994	29.35

Wind blows from areas of high pressure to areas of low pressure.

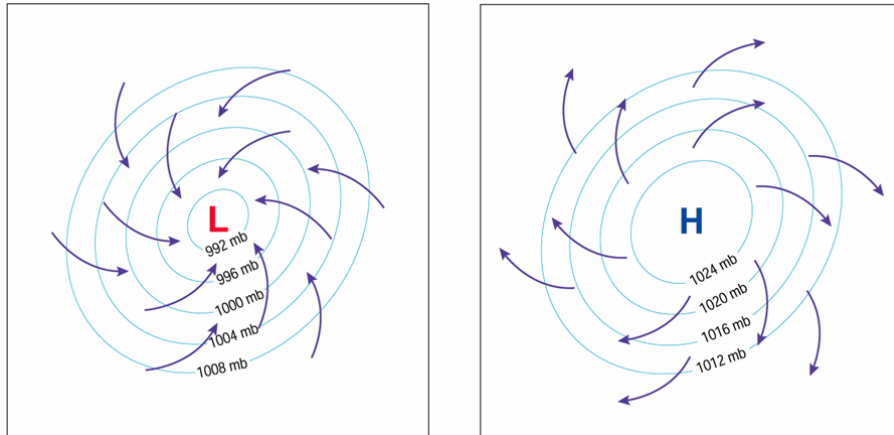
Draw the relationship between air pressure and air density.
air that is higher pressure is higher density



In a high pressure area, air will (rise, **sink**) because the air is (less, **more**) dense. This is because the air is (**cold**, warm) and (rises, **sinks**). Therefore, clouds CANNOT form.

In a low pressure area, air will (**rise**, sink) because the air is (**less**, more) dense. This is because the air is (cold, **warm**) and (**rises**, sinks). Therefore clouds are LIKELY to form.

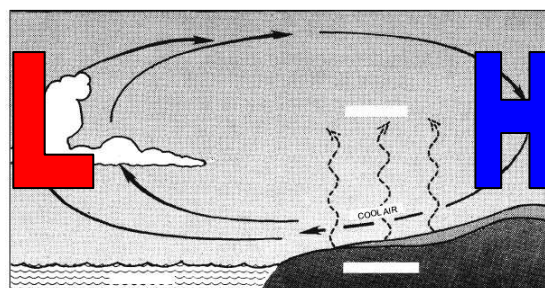
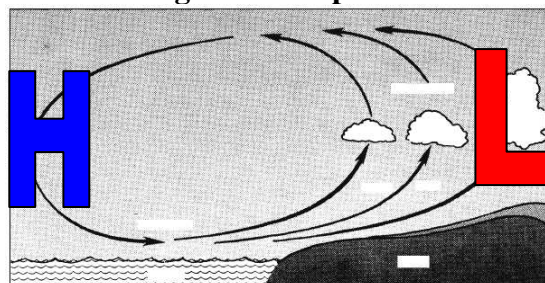
Correctly draw the direction of wind flow around both a high and a low pressure area in the NORTHERN HEMISPHERE.



CHARACTERISTICS OF HIGH AND LOW PRESSURE AREAS:

	LOW PRESSURE	HIGH PRESSURE
warm or cold air	WARM	COLD
air rising or sinking	RISING	SINKING
clouds or no clouds	CLOUDS	NO CLOUDS
clockwise or counterclockwise wind direction	COUNTER-CLOCKWISE	CLOCKWISE
winds toward or away from the center	TOWARD	AWAY

On the diagrams below, label which one represents a land breeze and which represents a sea breeze. Correctly label on each diagram where the high and low pressure areas would be found.



What's the relationship between wind and waves?

the higher the winds, the bigger the waves. A direct relationship

- Using the chart on page 14, state the prevailing wind direction for each latitude below:

45°N southwest
45°S northwest
75°N northeast
20°N northeast

Is air rising or sinking at the equator? rising

At 30°N is air rising or sinking? sinking

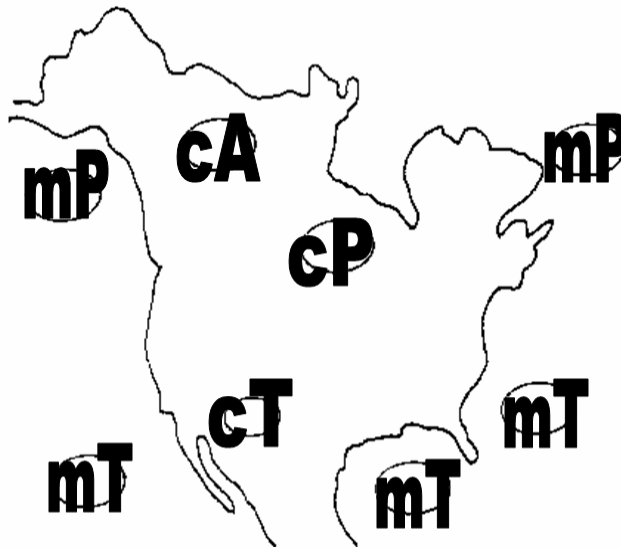
Air Masses and Fronts

- Air masses are classified based on their temperature and amount of moisture.
- Air masses get these properties based on where they form

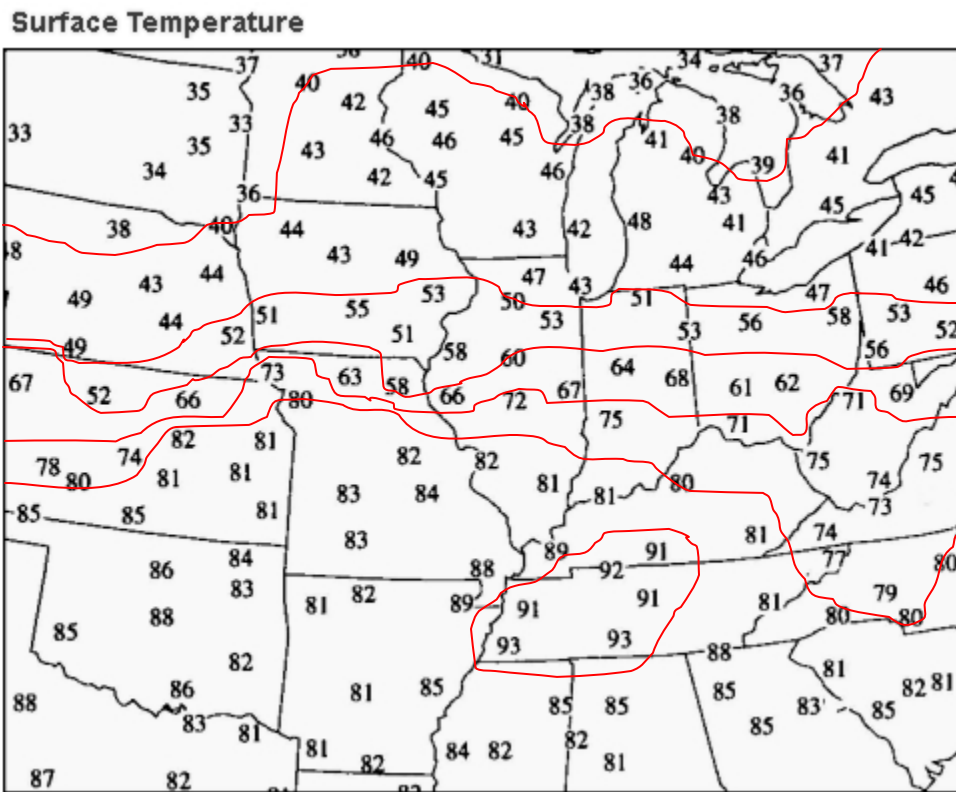
The abbreviations used to classify air masses use the following letters: c, m, T, P, and A.
For each letter, describe its property:

	Word	Means
c	continental	dry
m	maritime	moist
T	Tropical	warm
P	Polar	cold
A	Arctic	very cold

Using the diagram below, label the type of air mass that would form in that area. Use the abbreviations from the ESRTs page 13.



Isotherm Map: Complete the isotherm map below using 10°F isotherms

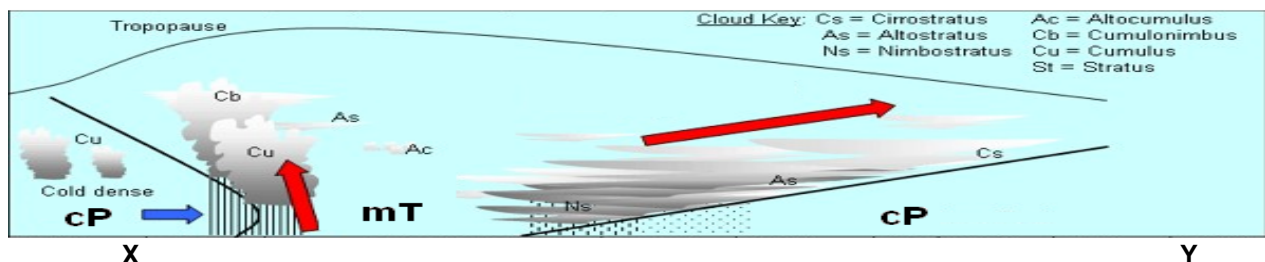
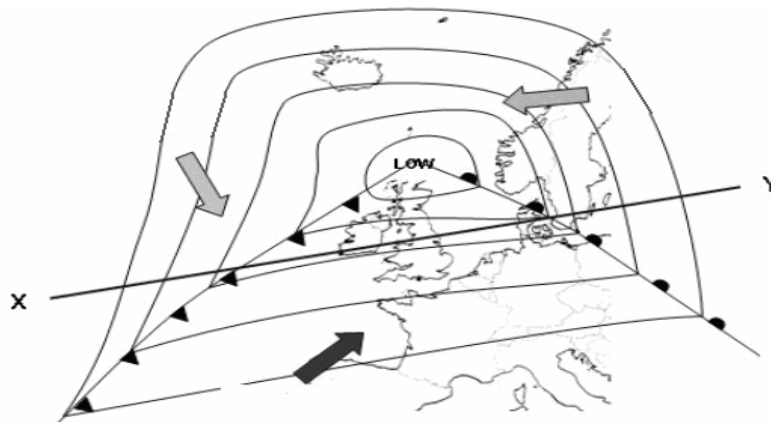


A FRONT IS A boundary (**interface**) BETWEEN AIR MASSES.



- On a weather map, the symbol above at **A** indicates: (a) a warm front moving north; (b) a cold front moving south; (c) a stationary front with warm air on the south side; (d) a stationary front with cold air on the south side; (e) an occluded front.
- On a weather map, the symbol above at **B** indicates: (a) a warm front moving north; (b) front moving south; (c) a stationary front with warm air on the south side; (d) a stationary front with cold air on the south side; (e) an occluded front.
- On a weather map, the symbol above at **C** indicates: (a) a warm front moving north; (b) a cold front moving south; (c) a stationary front with warm air on the south side; (d) a stationary front with cold air on the south side; (e) an occluded front.
- On a weather map, the symbol above at **D** indicates: (a) a warm front moving north; (b) a cold front moving south; (c) a stationary front with warm air on the south side; (d) a stationary front with cold air on the south side; (e) an occluded front.
- On a weather map, the symbol above at **E** indicates: (a) a warm front moving north; (b) a cold front moving south; (c) a stationary front with warm air on the south side; (d) a stationary front with cold air on the south side; (e) an occluded front.

On the map below, label the warm and cold fronts. Additionally, write the abbreviations for the three air masses.



COLD FRONTS:

Using the Words below, complete the paragraph.

15 degrees, cold, cold, colder, colder, cooler, clouds, drier, hail, rain, thunderstorms, tornadoes, towering clouds
form, warm, warmer

Passage of a cold front:

Cold fronts occur when a **.cold.** air mass replaces a**warm**..... air mass.

In a cold front the **..cold**..... air follows the warm air, and, because**cold**..... air is denser, pushes **...warm**..... air out of its way, forcing the warm air to rise.

The lifting warm air mass becomes **...colder**....., and**clouds**..... start to form.

Precipitation at cold fronts are usually heavier although less extensive (50-70 km) and less prolonged.

The reason for this is that the uplift of warm air there is stronger due to the undercutting of cold air, so....**towering clouds**....., and **.rain**...,**thunderstorms**....., **.hail**..... and**tornadoes**.. can occur.

The air behind a cold front is noticeably**cooler**..... and**drier**..... than the air ahead of it.

When the cold front passes through, temperatures can drop more than**15 degrees**..... within the first hour.

WARM FRONTS:

Using the Words below, complete the paragraph

air, cirrus clouds, cold, colder air mass, in front of them, lifts up, move slowly, settling over the cold front,
warm, warmer, warmer and more humid

Warm fronts:

Warm fronts occur, when a**warm**.....air mass approaches a**colder air mass**.....

The warmer air**lifts up**..... and over the colder air.

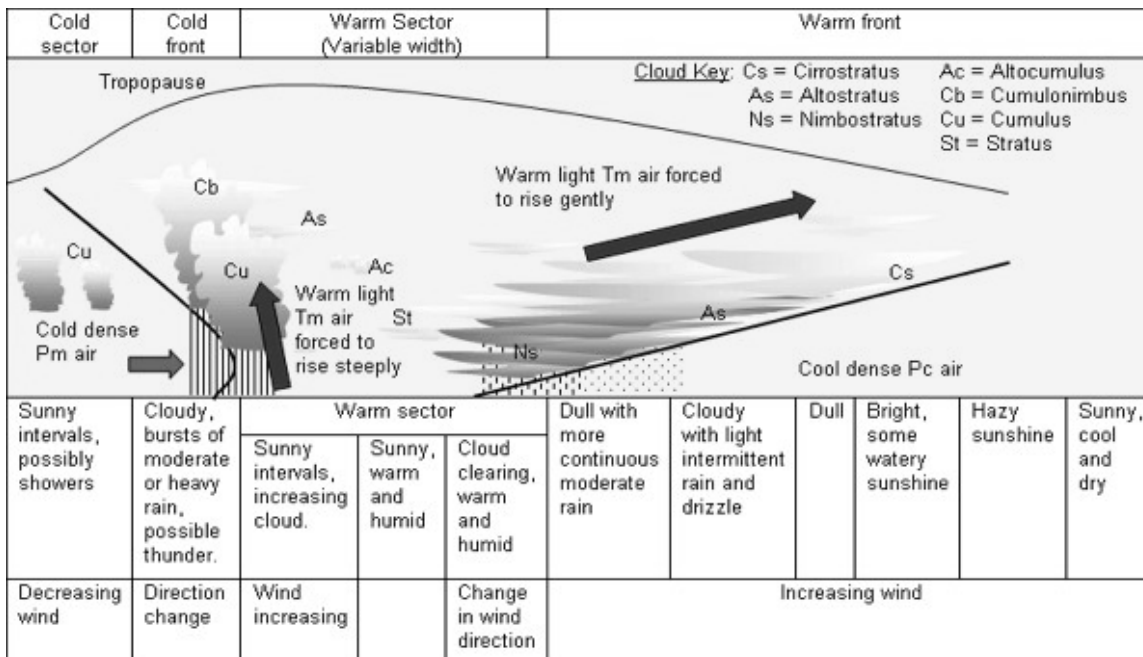
.....**Warm**.....fronts are usually more gentle than **...cold**.....fronts,**move slowly**....., gently
.....**settling over the cold front**.....and moving it out of the way.

Precipitation at warm fronts are usually less heavy although more extensive (300-400 km), than at the cold fronts. The**air**.....behind a warm front is warmer and more moist than the air ahead of it.

Warm fronts bring more steady, lighter rain or snow **...in front of them**..., which can last from a few hours to several days. When a warm front passes through, the air becomes noticeably**warmer**.....than it was before.

The first signs of the warm front are the**cirrus clouds**....., followed by the cirrostratus, altostratus, nimbostratus and stratocumulus types of clouds.

Warm vs Cold Fronts



<http://www.coolweather.co.uk/htdocs/fronts.htm>

Hazardous Weather and Safety

Give two other names for hurricanes: cyclone and typhoon

Hurricanes are areas of intense LOW pressure. (H/L)

Which covers a greater geographic area? **hurricanes** or tornadoes

Name two safety precautions to take for HURRICANES:

- A. HAVE EXTRA MONEY ON HAND
- B. BOARD UP WINDOWS, AND EVACUATE

Name two safety precautions to take for TORNADOES:

- A. GO TO THE LOWEST LEVEL OF THE HOUSE
- B. GET INTO A STORM SHELTER