

Warm Up: Start a new page

1.) How was your winter break!?

2.) What is the difference between weather and climate?

-weather is what's happening at a specific time and place
 -climate is weather patterns over an extended period of time

3.) What are the 2 most abundant gases in our atmosphere and what are their percentages?

-Nitrogen: 78%
 -Oxygen: 21%

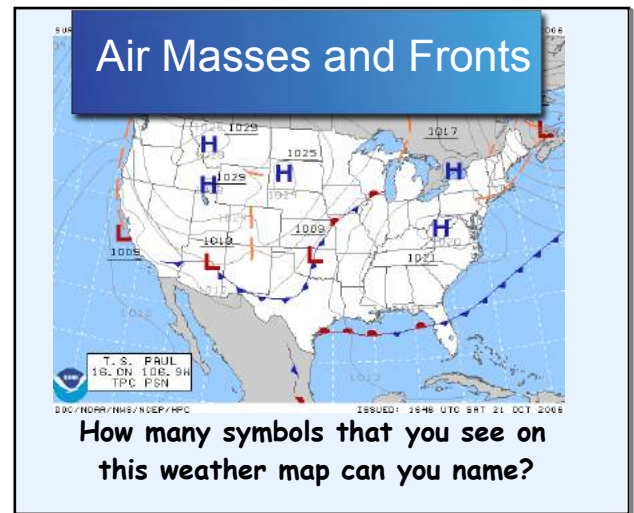


Weatherman Project



You will become weathermen!

Make sure to learn a lot about how weather works (air masses, fronts, pressure systems, etc.) in order to create a weather report that you will record in front of a green screen in the LTV room!



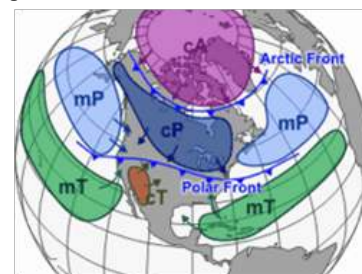
Air Masses

Listen to the evening news in the winter and you may hear a weather forecast like this:

"A huge mass of Arctic air is moving our way, bringing freezing temperatures."

Today's weather can be influenced by air from thousands of kilometers away—perhaps from Canada or the Gulf of Mexico. A huge body of air that has similar temperature, humidity, and air pressure at any given height is called an air mass. A single air mass may spread over millions of square kilometers and be up to 10 kilometers deep.

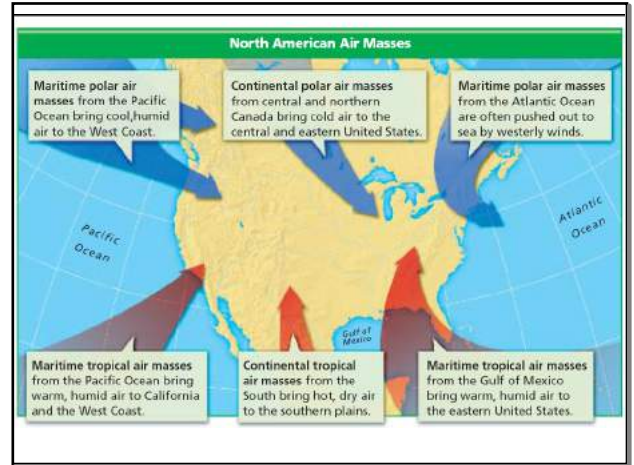
Scientists classify air masses according to two characteristics: temperature and humidity. Four major types of air masses influence the weather in North America: maritime tropical, continental tropical, maritime polar, and continental polar.



Typical Air Mass Types



- Arctic** – very cold and very dry
- Continental polar** – cold and dry
- Maritime polar** – cool and moist
- Maritime tropical** – warm and moist
- Continental tropical** – hot and dry



Cold Air vs. Warm Air

The characteristics of an air mass depend on the temperatures and moisture content of the region over which the air mass forms.

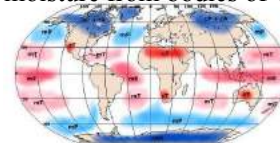
Remember that temperature affects air pressure.

- Cold air = more dense and higher pressure
- Warm air = less dense and lower pressure.
- Tropical air masses: warm, form in the tropics and have low air pressure.
- Polar air masses: cold, form north of 50° north latitude and south of 50° south altitude, have high air pressure.

Wet Air vs. Dry Air

Whether an air mass is humid or dry depends on whether it forms over water or land.

- Maritime air masses form over oceans. Water evaporates from the oceans, so the air can become very humid.
- Continental air masses form over land. Continental air masses have less exposure to large amounts of moisture from bodies of water.



Copy this chart on the LEFT to help you with air mass types.

	Wet	Dry
Warm	 Marine tropical	 Continental tropical
Cool	 Marine polar	 Continental polar

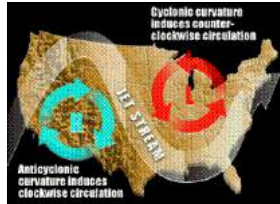
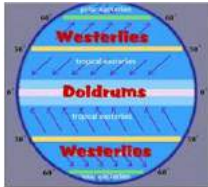
To sum it all up...

- continental polar = cool, dry = **cP**
- continental tropical = warm, dry = **cT**
- maritime polar = cool, moist = **mP**
- maritime tropical = warm, moist = **mT**
- continental arctic = very cold, very dry = **cA**



Winds: 2 methods for air mass movement

- Prevailing Westerlies: Pushes air masses from west to east.
- Jet streams: Pushes fast moving air masses from west to east



Go Over Places for the matching Game on next slide.



Daily Warm Up

- 1.) In a swimming pool or lake, where is the coldest water always found?
 - 1.) at the bottom
 - 2.) Because the density of cold water is greater than the density of warm water, causing it to sink
 - 3.) The bottom of the pot (the part touching the burner) will become hot. This heats the water in the bottom of the pot and since hot air/hot water rises it would then move to the top of pot of water. The bottom layer of water (now heated) will then be pushed to the water in the top. This circulation continues until the entire pot boils. This is an example of convection currents. This principal can also be applied to air.
 - 4.) an aneroid barometer has no liquid in it, while a mercury barometer does.
- 2.) Can you tell me why?
- 3.) If you put a cold pot of water on the stove, what happens as the pot is heated?
- 4.) What is the difference between a mercury barometer and an aneroid barometer?

Convection Currents Demo

Make sure the teacher has these things to show you a demo of convection currents:

1. Convection current container.
2. Red food coloring and Blue food coloring
3. A liter of cold water and a liter of hot water
4. colored pencils/crayons

Convection Currents Demo

Please make sure that the teacher follows the directions below or it could mess up the demo:

1. Fill the Convection current container with
 - a. 1/2 Hot Red food coloring
 - b. 1/2 Cold Blue food coloring

****Write your hypothesis: What do you think will happen when I pull the middle divider?**
2. Give the water a couple of seconds to calm down.
3. Pull the middle divider
5. Observe and record in your journals what you see happening

Convection Currents Demo

So what's happening?

Where did the red go?

How about the blue?

Water is flowing from one position to another; heat is being transferred; convection is occurring in the container! The cold, blue water sinks, while the warmer, red water rises. The red water stays higher than the blue.

What does this have to do with weather?

When we get to our section on weather fronts, we will again discuss how warm rises over cold. Warm fronts rise over cold fronts and cold fronts push under warm fronts. You'll see this information again!

What type of air mass does the red water represent?

How about the blue water?

How does this relate to a thunderstorm?

pull

pull

pull

Fronts

Fronts are typically classified according to the direction of their movement.

4 main types of fronts: Warm, Cold, Stationary, and Occluded

Another key term:

Fluid- anything that flows and fills its container such as a liquid or a gas

Fronts Foldable

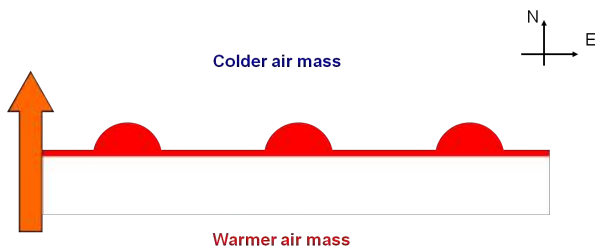
Create a 4 flap foldable.

Label Each Flap

Follow Along in the notes to add information to each front.

Cold Front	Warm Front
Stationary	Occluded

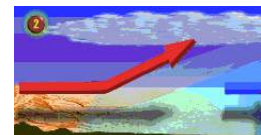
Warm Front



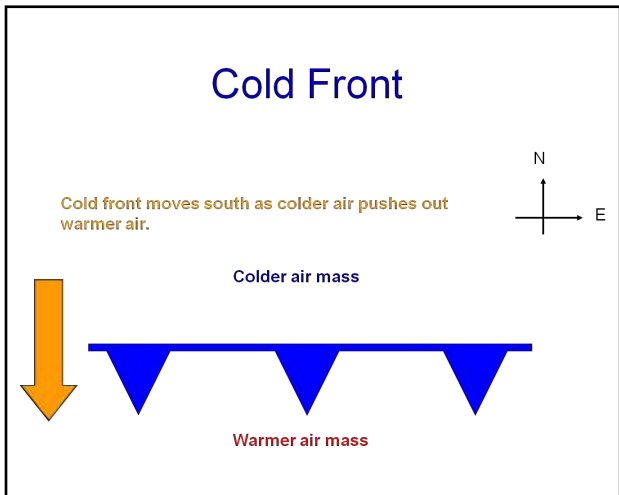
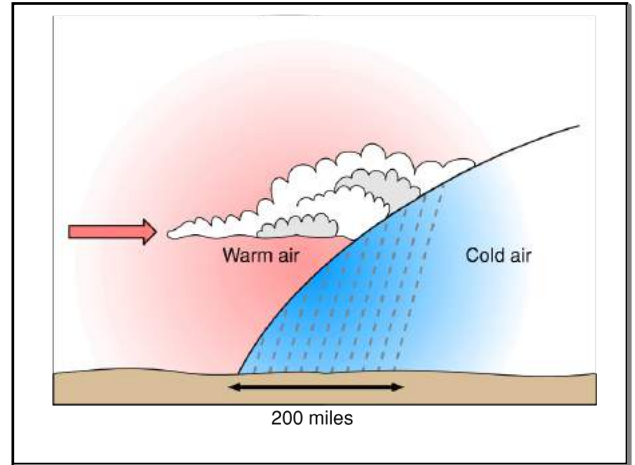
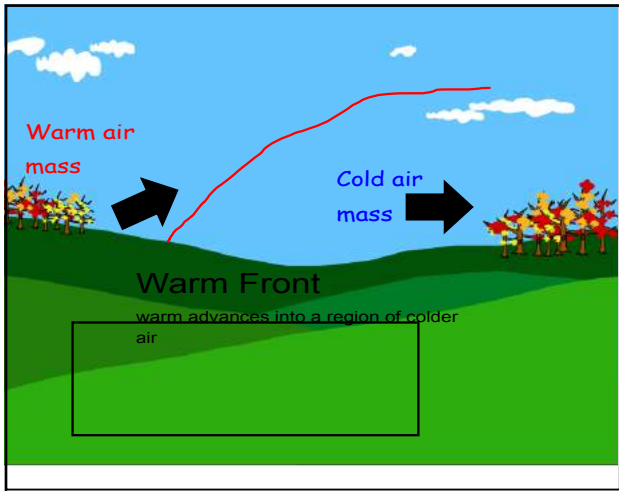
Warm front moves north as warmer air pushes out colder air.

Warm Front

- A fast moving warm air mass overtakes a slow moving cold air mass.
- Can cause extended periods of rainy or cloudy weather.
- Warm, humid weather usually follows a warm front.





Warmer air pushes over cold air

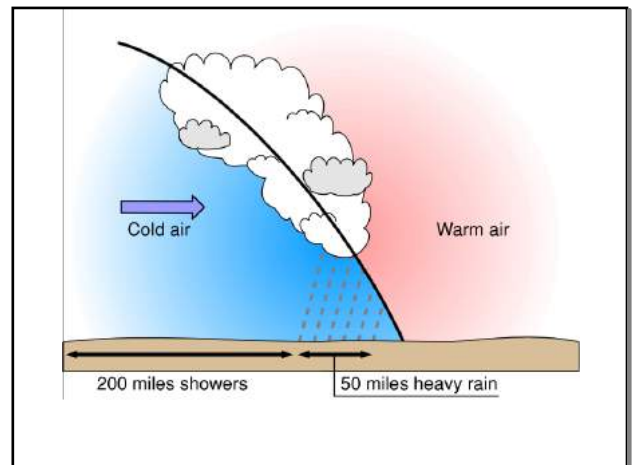
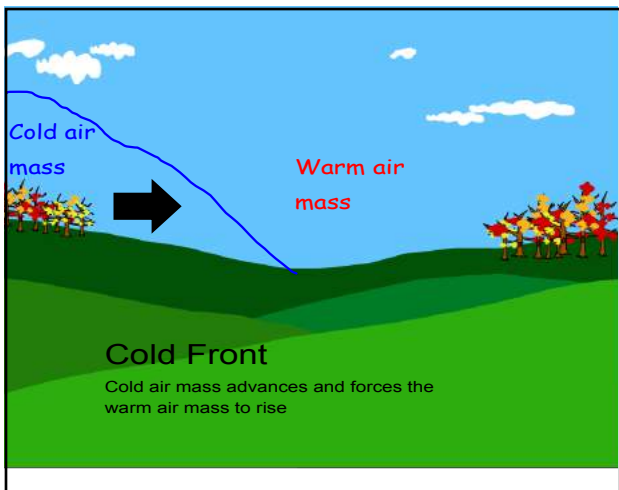


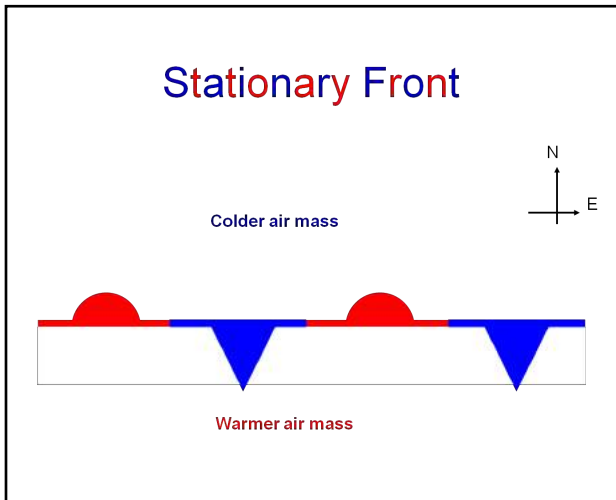
Cold Front

- Fast moving cold air mass overtakes a slower moving warm air mass.
- Can cause abrupt weather changes particularly thunderstorms.
- Clear skies, a change in wind, & lower temperatures usually follow a cold front.

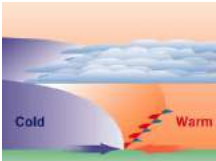

Colder air pushes under warmer air lifting warmer air



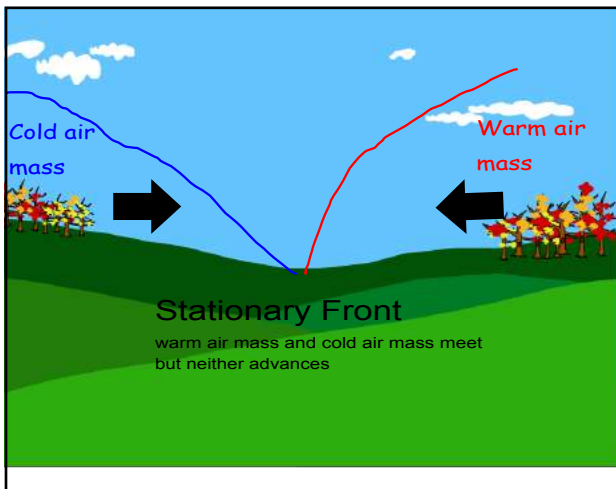


Stationary Front

- A cold and warm air mass meet but neither can move the other.
- Can cause extended periods of precipitation; snow, rain, fog or clouds.





Cold and warm air masses meet but neither one and trapping warm air above pushes the other (warm air still rises upward)




Occluded Fronts

Cold air mass and warm air mass moving together.



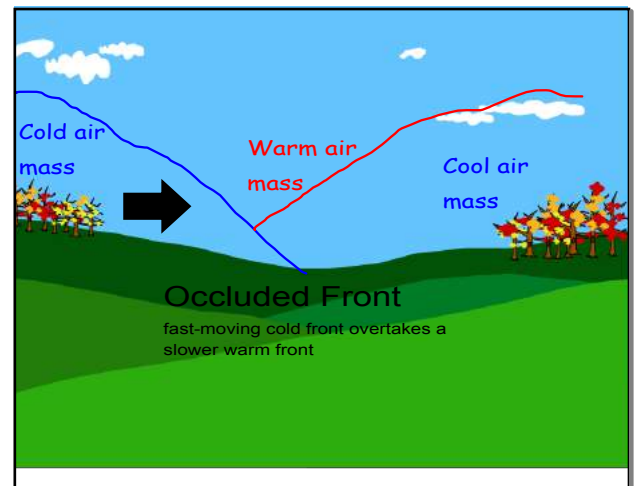
Occluded Front

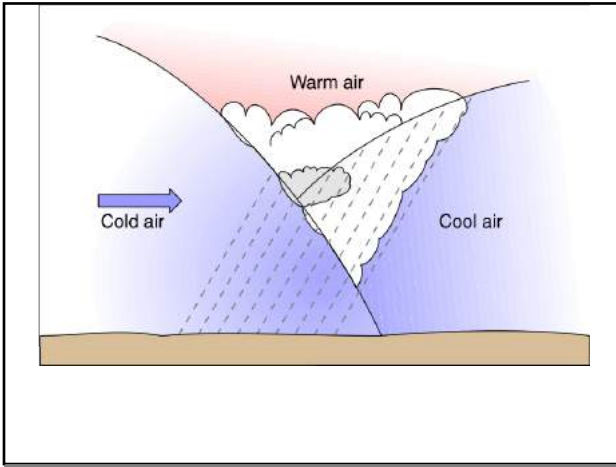
- A warm air mass is caught between 2 cooler air masses.



Cold front catches up to warm front lifting and trapping warm air above

A warm air mass is caught between two cooler air masses. The denser cool air masses move underneath the less dense warm air mass and push the warm air upward. The two cooler air masses meet in the middle and may mix. The temperature near the ground becomes cooler. The warm air mass is cut off, or **occluded**, from the ground. As the warm air cools and its water vapor condenses, the weather may turn **cloudy and rain or snow may fall**.





Lets take a look at these pictures in motion...

Word	Description
<input type="text"/>	warm and cold air mass meet but neither advances warm front
<input type="text"/>	warm air mass advances toward a cold air mass stationary ...
<input type="text"/>	cold air mass pushes under a warm air mass occluded front
<input type="text"/>	a warm air mass is cut off the ground as by cooler air beneath cold front

Warm Up

- Which air masses form over land and which air masses form over water?
 - Continental form over land while maritime form over water
- As altitude increases in the troposphere, what happens to the air temperature?
 - it decreases or gets colder
- As altitude increases, what happens to the air pressure and density?
 - both decrease

High vs Low Pressure Systems

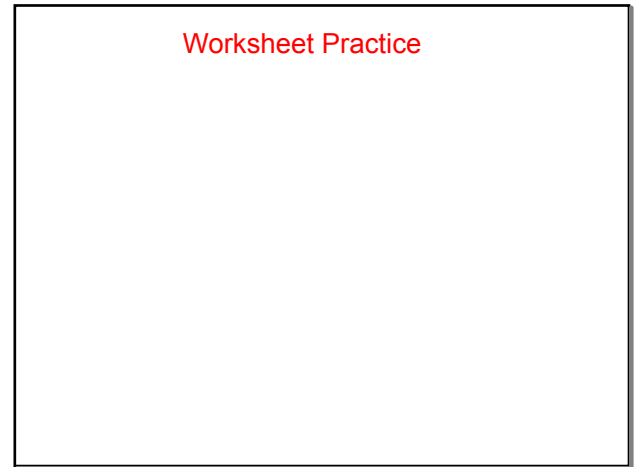
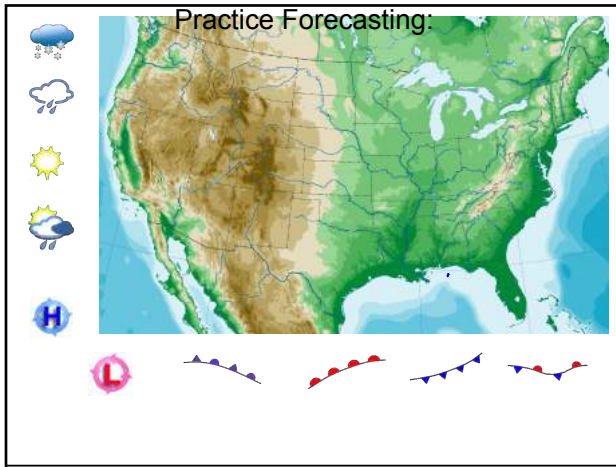
High Pressure-

- Region of the greatest atmospheric pressure.
- Winds rotate in a clockwise: "anti-cyclonic."
- Associated with clear skies and dry weather
- Represented by an "H" on a weather map

Low Pressure-

- Region of the lowest atmospheric pressure.
- Winds rotate counter-clockwise: "cyclonic."
- Associated with storms and precipitation
- Represented by an "L" on a weather map

Watch Forecasting Video





Warm Up

- 1.) What are the 4 types of air masses and what are their characteristics?
 - 1.) Copy chart on next page.
- 2.) What are storms?
 - 2.) violent disturbances in the atmosphere
- 3.) What is your most memorable weather experience?


What are Storms?

- > **Violent disturbances within the atmosphere.**
- > Caused by sudden changes in air pressure which cause rapid air movement in an area.
- > **Cumulonimbus clouds, or thunder clouds** are created by this air movement.

> Thunderstorms

- Fast moving storms that are often accompanied by heavy precipitation, frequent thunder and visible lightning.
 - « **Lightning: electrical discharge when the build up of negative charges within the air attract to the positive charges on Earth.**
 - » **Cloud to cloud**
 - » **Cloud to ground**
 - » **Cloud to air**
 - « Thunder is caused as air is superheated (30,000°C), expands, and explodes.
 - » **Thunder** is the sound wave created from the explosion.
 - » Because sound travels slower than light, thunder always comes after lightning not the other way around.



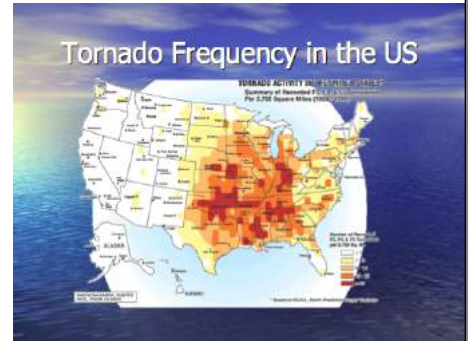

Tornados -

- **Funnels of high speed, spinning air.**
- Typically form during the Spring & Summer.
- Tornadoes were classified with the Fujita scale (F-0 through F-5). Now: **Enhanced Fujita Scale (EF-0 through EF-5)**
- A **tornado watch** means that one is possible; a **tornado warning** means that one has been spotted nearby.



Tornado Alley:

- Texas
- Indiana
- Kansas
- Nebraska
- Oklahoma
- Illinois



"Hurricane" Origin

"Huracan" is the hurricane god of Maya mythology= Atlantic Ocean

"Kyklōma" Greek word for 'wheel, coil of a snake' became Cyclone= Indian Ocean

"Táifēng" Chinese (Mandarin) word meaning "Typhoon"= Pacific Ocean

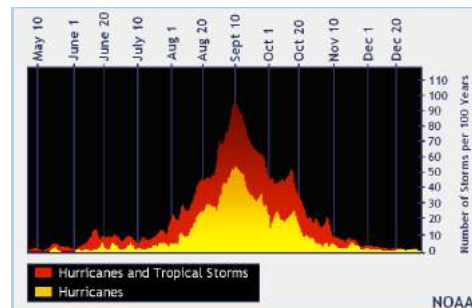


Hurricanes - Severe tropical storms that **form over warm water.** Hurricanes rotate in a counterclockwise direction around an "eye."

Hurricane Tracker



Hurricane Season



June-November Peak: Aug-Oct

Trade Winds

- Once the growing low pressure system is out over the warm water of the Atlantic Ocean, the **Trade Winds guide it to the west.**
- The travel 2,000 to 3,000 miles of warm ocean water.



4 Stages of Hurricane Development

Low pressure begins as a **Tropical Disturbance**

The low pressure systems that blow out over the waters of the Atlantic Ocean begin as **Tropical Depressions** (a low pressure system is in fact a "depression" of pressure)

If winds in the system reach 39mph, the system becomes classified as a **Tropical Storm** (and it is given a name)

If the system continues to gain strength and winds speeds reach 74 mph, it is officially classified as a **hurricane**.



How do they measure hurricanes?

Saffir-Simpson Hurricane Scale

Category	Wind speed (mph)	Storm surge (feet)
5	156	More than 18
4	131-155	13-18
3	111-130	9-12
2	96-110	6-8
1	74-95	4-5
Additional classifications		
Tropical storm	39-73	0-3
Tropical depression	0-38	0

Hurricanes are named by the World Meteorological Organization. They start with the letter "A" and alternate male and female names.

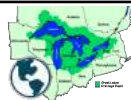


Hurricane Katrina was a category 3 hurricane when it made landfall near New Orleans, La on August 29, 2005.

- » Costliest natural disaster
- » 6th strongest to form, 3rd strongest to make landfall
- » 1 of the 5 deadliest

Winter storms

- Lake effect snow
 - « Increased snow fall caused by cold dry air moving across a warmer body of water.
 - « It becomes more humid as water vapor evaporates from the lake surface.
 - » Great Lakes area (Michigan, Wisconsin, & Buffalo, NY)



OTHER NATURAL DISASTERS:

Floods - Caused by stationary or slow-moving thunderstorms that produce heavy rain over a small area. Flash floods can strike any time and any place with little or no warning. Natural processes, such as hurricanes, weather systems, and snowmelt, can also cause floods. Failure of levees or dams and inadequate drainage can also result in flooding.



Flooding
in
Colorado
2013

Drought -

- Deficiency of precipitation over an extended period of time, usually one season or more.
- A drought is a prolonged, abnormally dry period when there is not enough water for users' normal needs.
- If water is constantly being recycled, how can we end up in a drought?



Tsunami - Series of waves generated by an undersea disturbance such as an earthquake. From the area of the disturbance, the waves will travel outward in all directions, almost like the ripples caused by throwing a rock into a pond. The tsunami is proportional to the intensity of the earthquake.



Click here
for another
cool
website :-)

Stop: Extra Slides

Warm Up

- 1.) If you have warm and cold air, which one will rise over the other and why? -warm air will rise because it is less dense than cold air
- 2.) What is the order of our 4 atmospheric layers, starting at the Earth's surface and going up? Troposphere, Stratosphere, Mesosphere, Thermosphere
- 3.) The Thermosphere is divided into 2 sub-layers. What are they called? Ionosphere and Exosphere

Warm Up: Read the passage about global warming (climate change) and answer the following questions:

- 1.) What is global warming?
- 2.) What could be the cause of global warming?
- 3.) How does global warming affect our weather?

Jet Streams

High above the surface there is little friction to slow down airflow and wind speeds often exceed 100 mph. Sometimes wind speeds exceed 200 mph. This rapidly flowing current of air located 10-15 km (6-9 miles) above the surface, is called the **jet stream**.

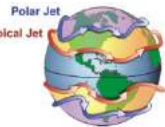
The jet stream is created by unequal heating of Earth. The fastest winds are found where the temperature change is greatest. From the diagrams below, notice how the general position of the jet stream changes from summer to winter. During summer months there is little temperature difference across the United States and the position of the jet stream moves northward. However, in winter months, when it is considerably warmer in Florida than it is in Wisconsin for example, there is a large temperature change across the United States. Since the jet stream is a result of temperature differences it is a useful temperature forecasting tool. The jet stream also has a wavelike pattern between colder air to the north and warmer air to the south.



The prevailing westerly flow of the jet stream takes on a wavelike pattern composed of a series of ridges and troughs. When the jet stream bulges to the north a high pressure ridge is formed. When your area is under the influence of a ridge, temperatures are generally warm and weather conditions fair. When the jet stream bulges southward, a low pressure trough develops. When your area is under the influence of a trough, temperatures are cool and weather conditions cloudy or stormy.

What's happening with our jet stream this year?

Trade papers with your neighbor. Look over their answers. Are they complete? Do they make sense? Are they correct?



1. What is the polar jet stream?
2. How does the jet stream influence weather in the United States?
3. The jet stream has been producing some strange weather occurrences this year. Provide some examples of this strange weather and explain how they are happening.
4. If this type of behavior from the jet stream continues, what could it mean for weather patterns in the United States?

Is global warming caused by us?

Bill Nye vs Marc Morano

- World's Most Polluted Places
- America's Most Polluted Cities
- World's Cleanest Cities
- America's Top 5 Cleanest Cities
- 5 of the Greenest Cities in the World



Warm Up -Quote Reflection

What does this week's quote mean to you?

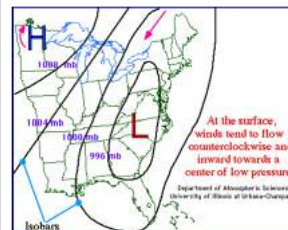
"What did you ever do to change the world?"

-from the movie "Pay It Forward"

Vocabulary (define these words)

Isotherms- contour lines on a map that connect areas of equal temperature.

Isobars- contour lines on a map that connect areas of equal atmospheric pressure.



Isotherms and isobars are somewhat "fluid" measures, so their lines on a map tend to be curved and irregular. These measures often are on a particular scale (every 100 C, or every 20 mb) representing a gradual change across a geographic region.

