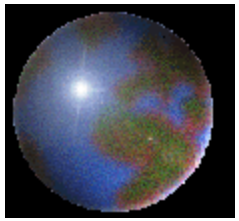
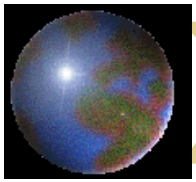


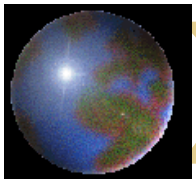
Air Masses and Fronts



Air Mass

Huge bodies of air that can cover entire continents or oceans

The air masses takes the characteristics of the land below it.



Characteristics of Air Masses

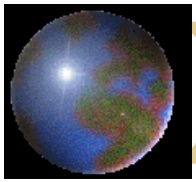
Maritime-Wet or Humid

Continental- Dry

Tropical- Warm or Hot

Polar- Cold

Arctic- Freezing

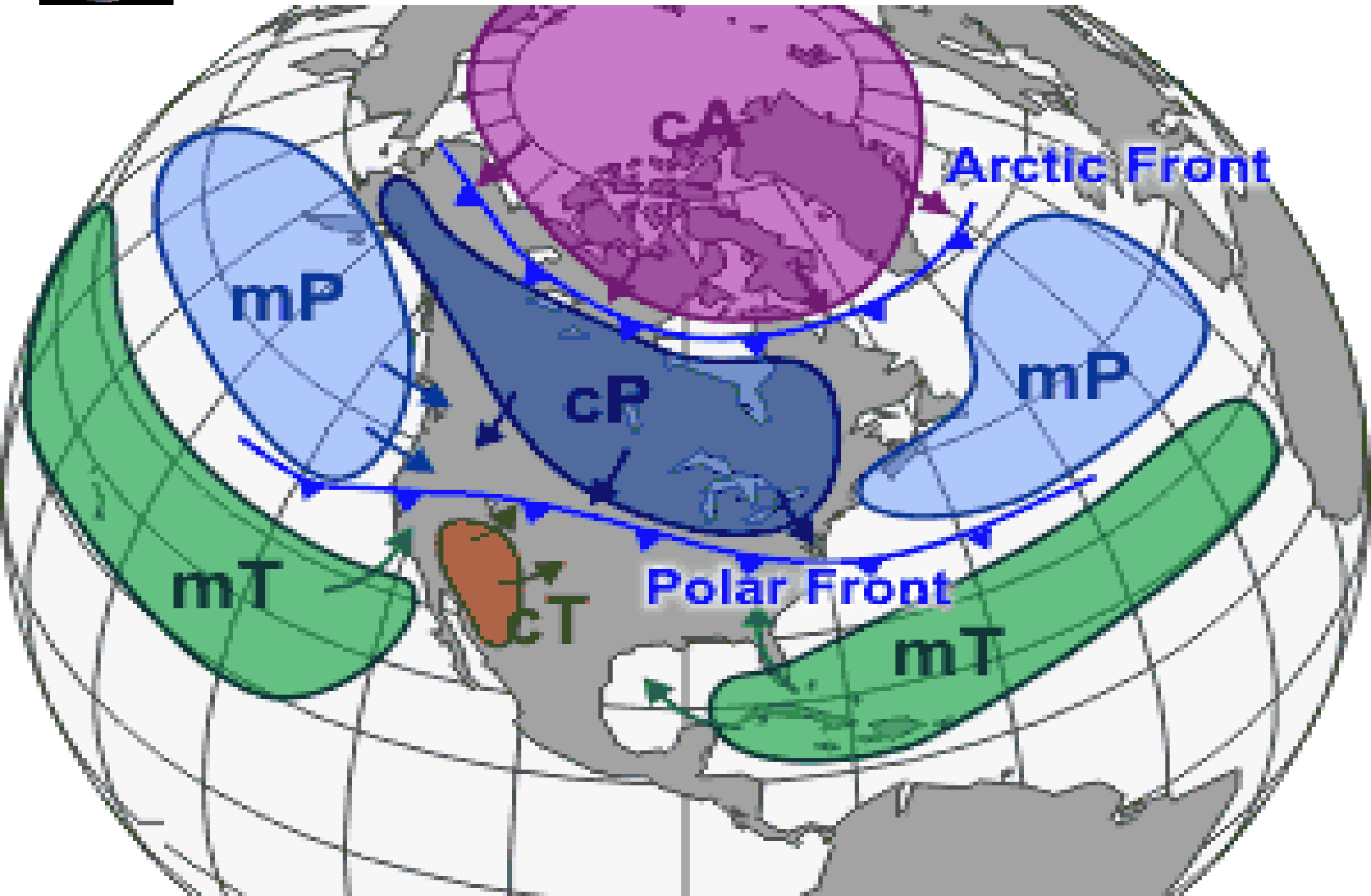


Characteristics of Air Masses

Air Masses are categorized by the amount of moisture and the temperature of the air mass.

Maritime Tropical (mT)- Wet and Warm

Continental Polar (cP)- Dry and Cold


cA
Arctic Front
mP
cP
mP
mT
cT
Polar Front
mT

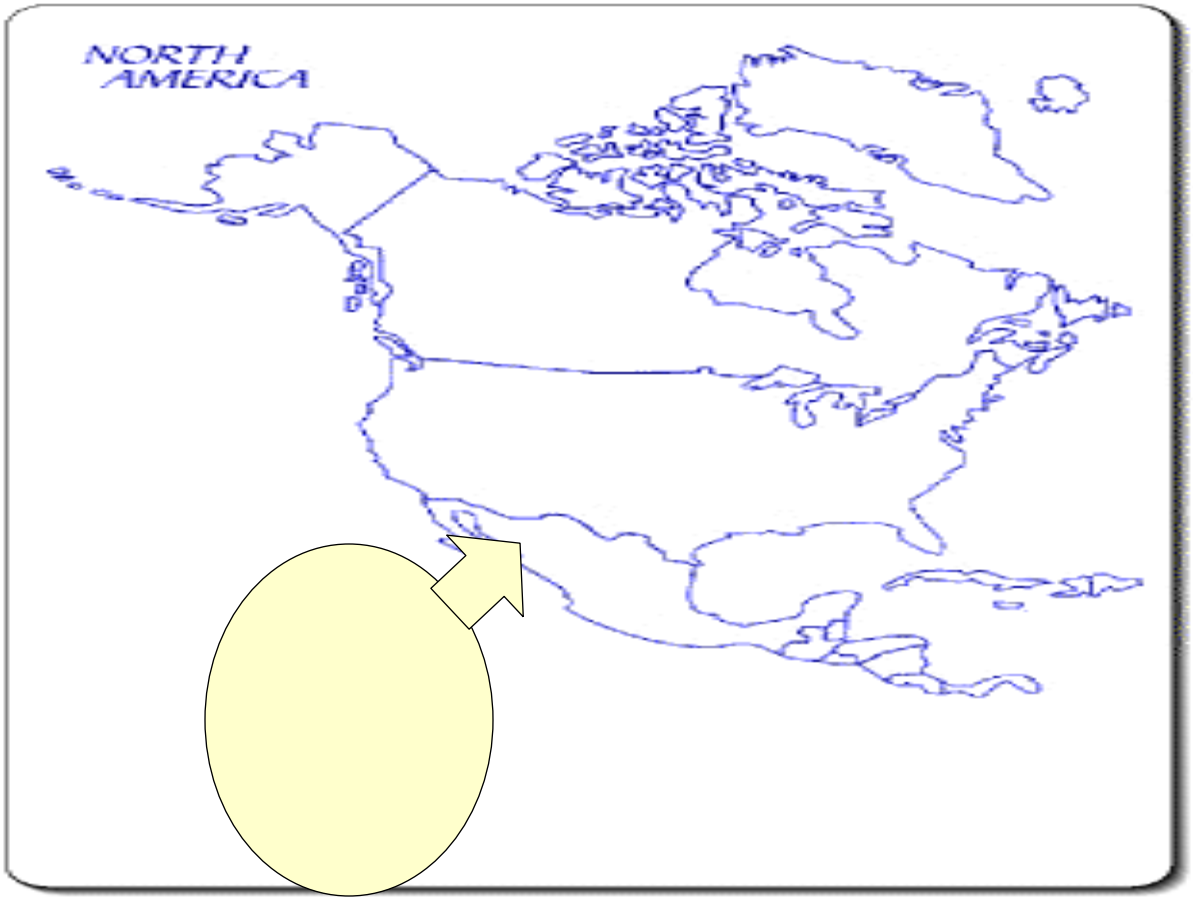
What type of Air Mass Would You Expect Here?

What type of Air Mass Would You Expect Here?

What type of Air Mass Would You Expect Here?

What type of Air Mass Would You Expect Here?

Complete Air Masses Assignment



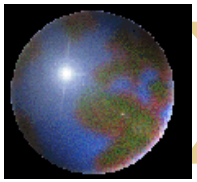
Fronts

The point where two air masses collide

The more dense air always goes underneath.

Cold air is more dense than warm air.

Wet Air is more dense than dry air.



Frontal Lifting

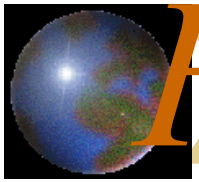
Four types of fronts:

A) warm front

B) cold front

C) *Stationary front*

D) Occluded front

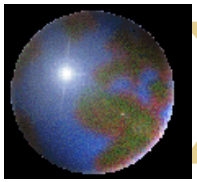


Fronts Assignment

In your Table Group, Complete your "Fronts" Assignment"

Each Person is responsible for one front.

We will do the occluded front.



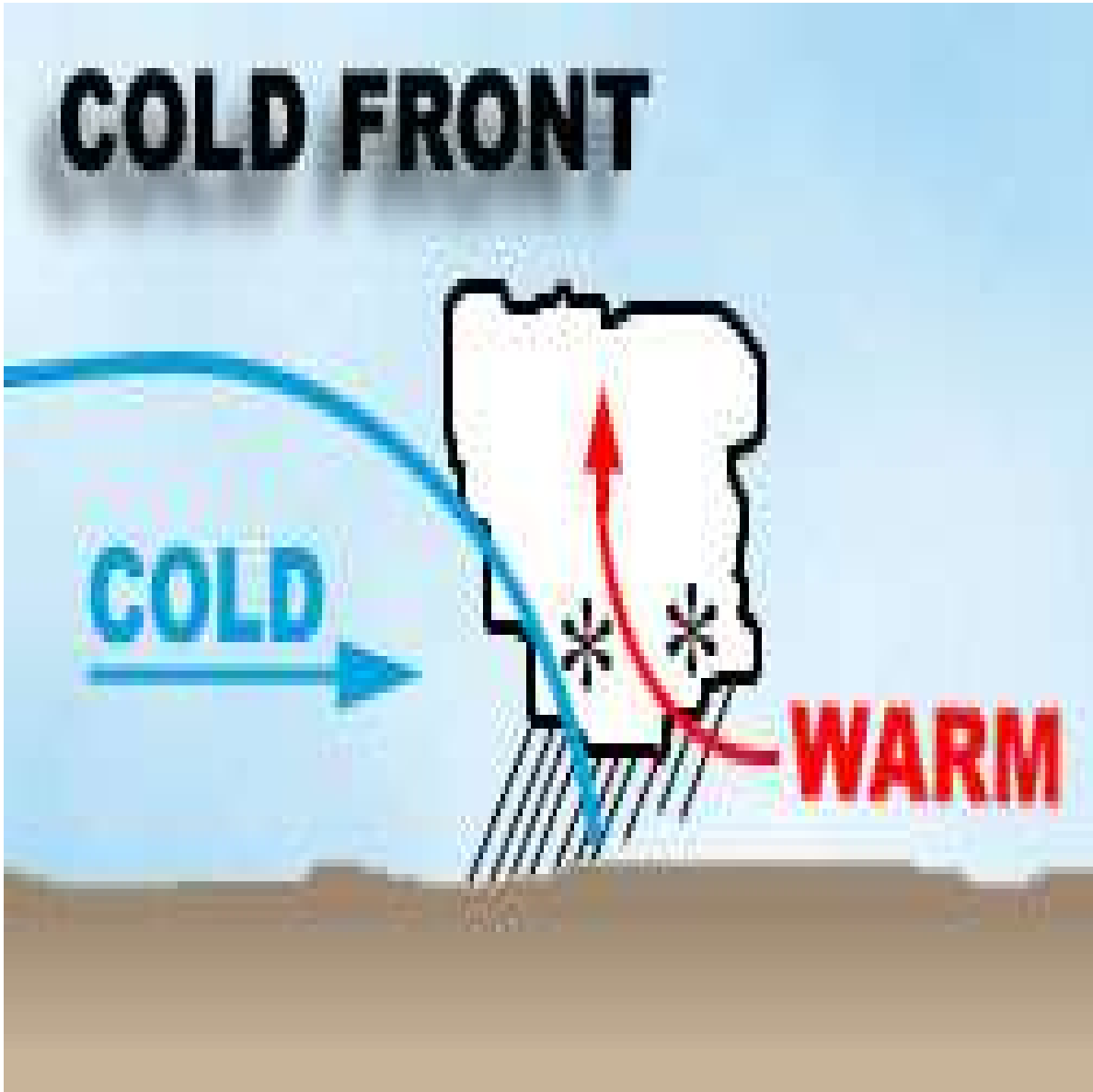
Frontal Lifting

Cold Front: When a cold air mass moves into a warm air mass.

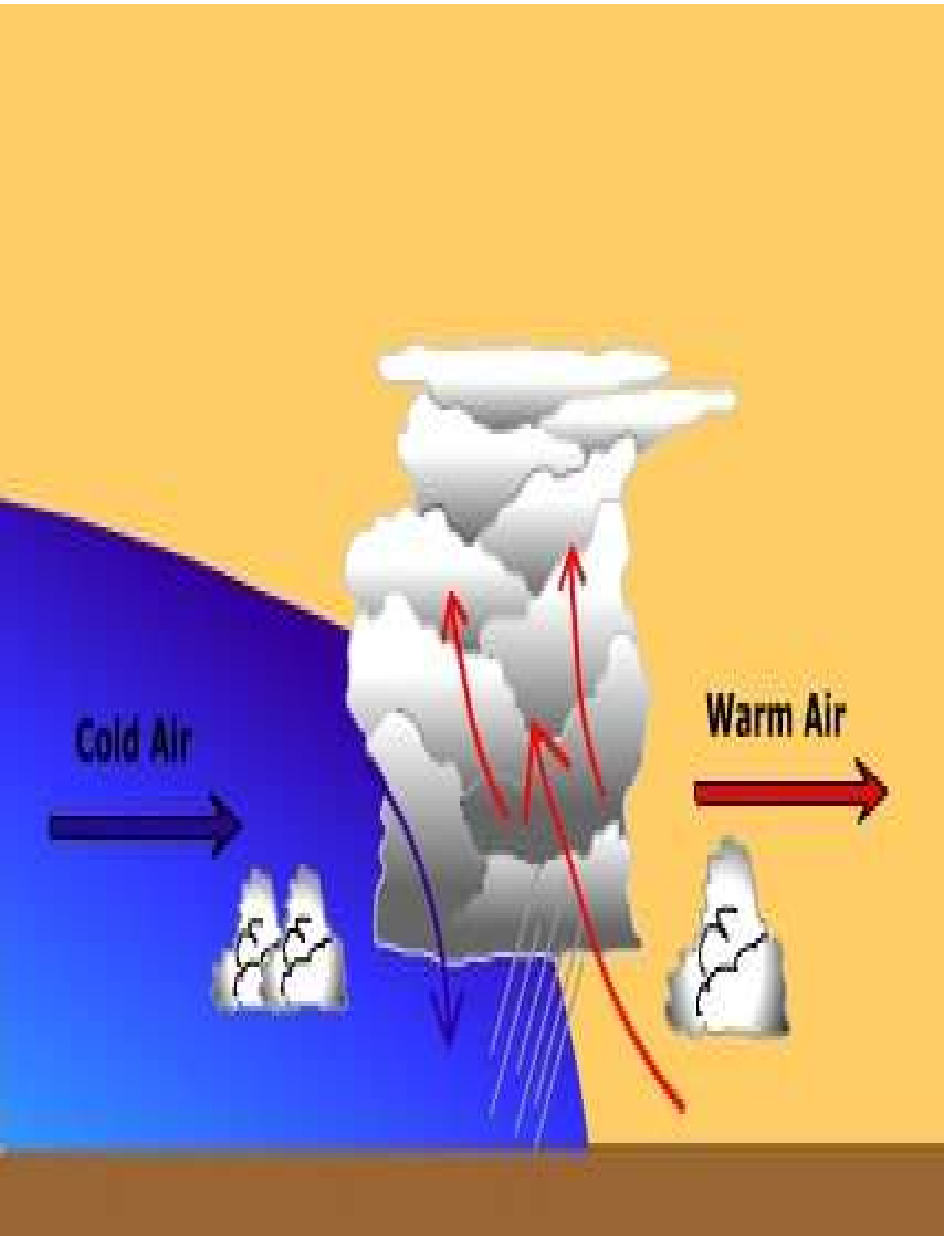
Cold, denser air forces the warm air up where it cools and condenses, forming clouds

Cold Front:

Warm air is abruptly pushed upward, cooling, condensing moisture.



Cold Front



Notice how steep the angle is between the two air masses

Typically brings sudden, heavy rains and storms

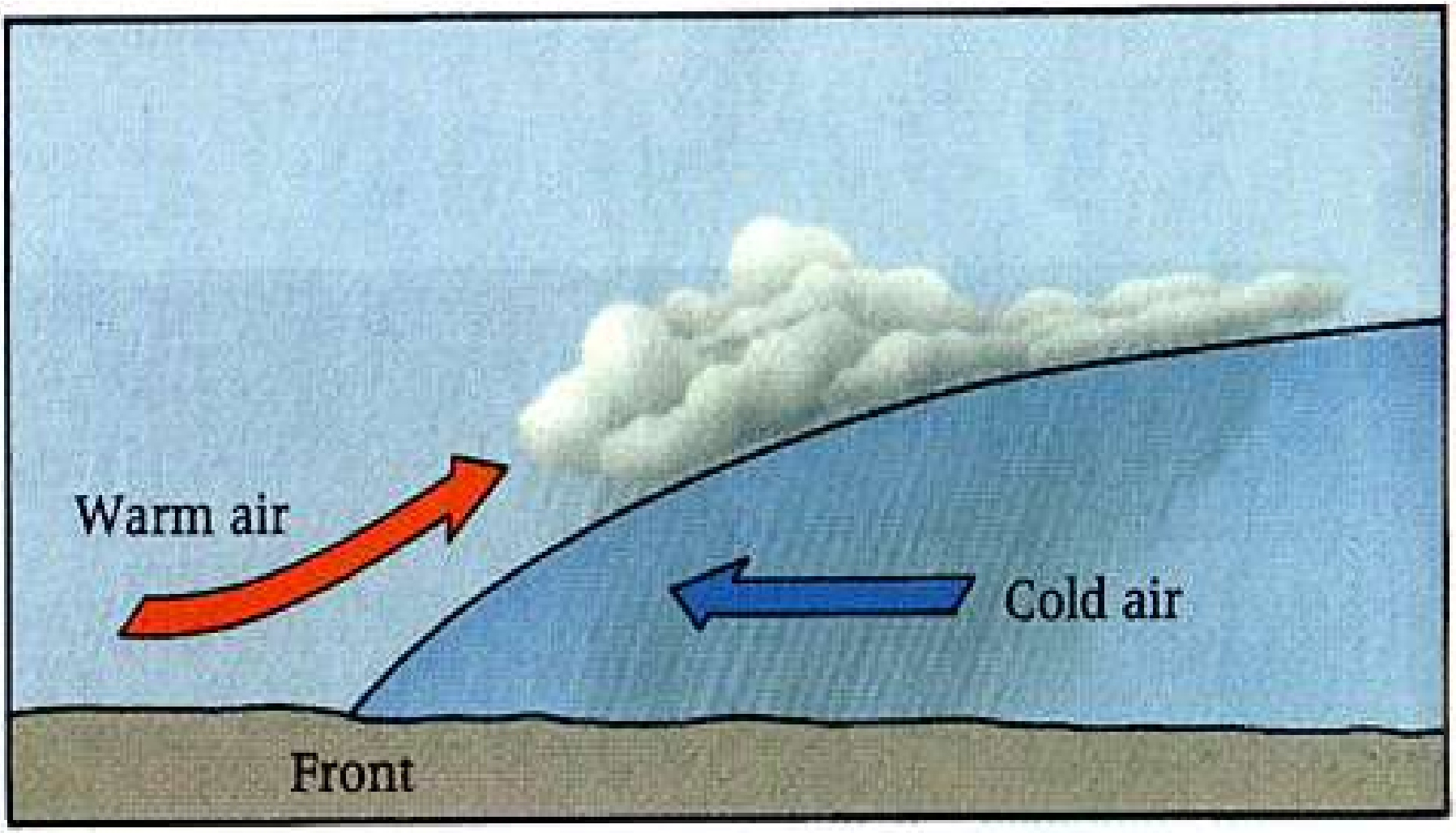
Cumulonimbus: Lake Superior

Warm Front

WARM FRONT: when a warm air mass moves into a colder,denser air mass.

Warm air rides up and over the colder air

Warm front



Cyclonic (frontal)

Warm Front

Notice the angle of slope between the two air masses.

Warm Front

- The weather during a WARM FRONT starts with cirrus clouds about 24-48 hours before the rain begins
- Cirrus clouds are "at the front of the front"

Warm Front

As more warm air is pushed upward, more moisture condenses forming cirrostratus clouds

Cirrostratus on Lake Superior

Warm Front

- As warm more warm air is pushed up, heavier clouds form mid-way up over the cold air
- Altostratus and stratus

Altostratus clouds: ***Lake Superior***

Warm Front

The final cloud type in a warm front is the nimbostratus

"nimbo" = "rain"

Warm Front

Warm front: rain or snow is steady over several hours or days

Stationary Front

Stationary

Two air masses meet and neither move forward.

Stationary Front

Weather Patterns

Cloudy, Wet weather that last for days

Stationary Front

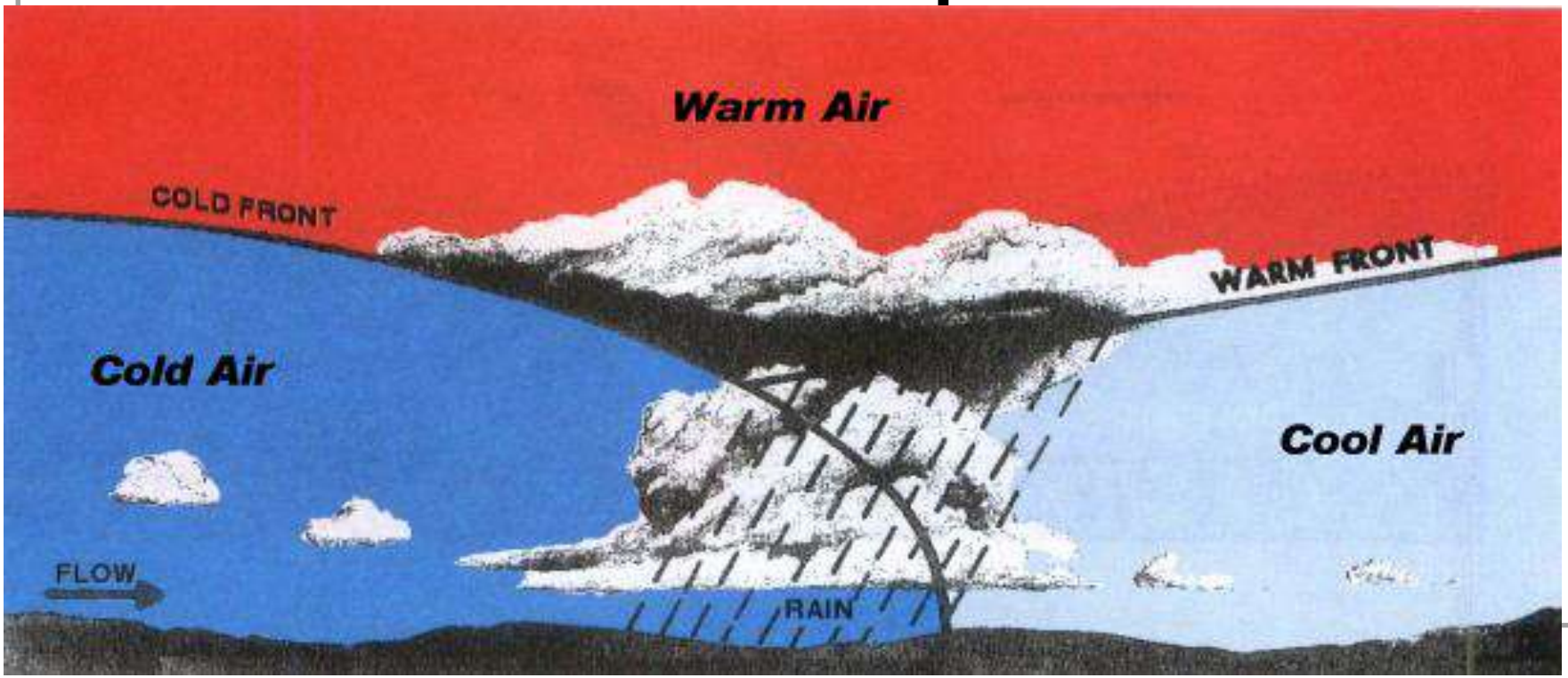
Weather Patterns

Two air masses meet and neither move forward.

Occluded Front

Occluded

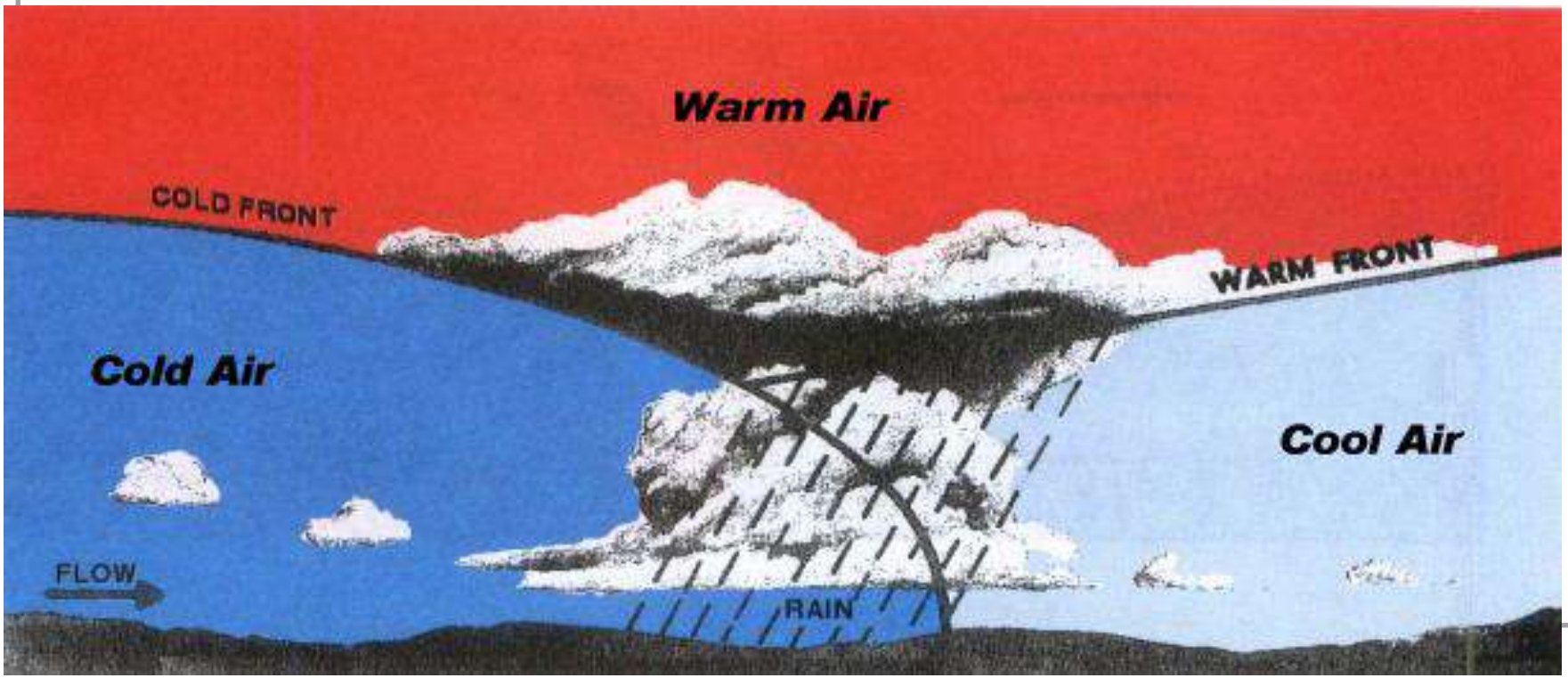
Two cold air masses squeeze a warm air mass up.

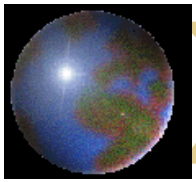


Occluded Front

Occluded

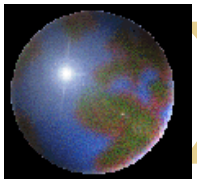
Rain happens on both sides of the front.





Quiz Yourself!!!

T or F

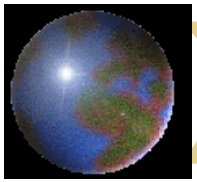


QUIZ: T or F

For clouds to form, air must be ***lifted***

There are ***FOUR*** different types of lifting

Orographic lifting refers to air moving up and over a mountain



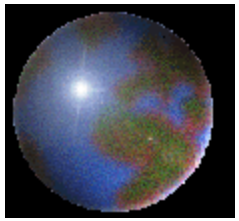
QUIZ: T or F

Convectional lifting is the circulation of warm air rising, cold air sinking

A rain shadow is caused by ***WET*** air descending down the leeward side of a mountain

A ***WARM FRONT*** means warm air is riding up over cold air

A ***WARM FRONT*** produces sudden, severe rain and storms



Severe Weather

Thunderstorms

Cold Fronts

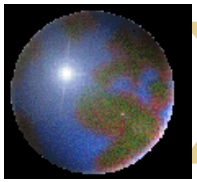
Begins with humid air rising, cooling, and condensing into a single ***cumulus*** cloud.

Cloud builds as they are "fueled" by warm, moist air from below.

Thunderstorms

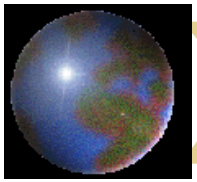
The droplets of water grow larger until they are so big that they fall as rain.

Cumulonimbus clouds: L Superior



Thunderstorms (con't)

- Lightning may be associated with T.storms
- Hits Earth 100 times per second
- Over 200 people in the US die each year from lightning.



Lightning

- Lightning is the cause of thunder
- returns nitrogen to the soil
- may cause fires
- May have helped start pre-biotic formation of amino acids(?)

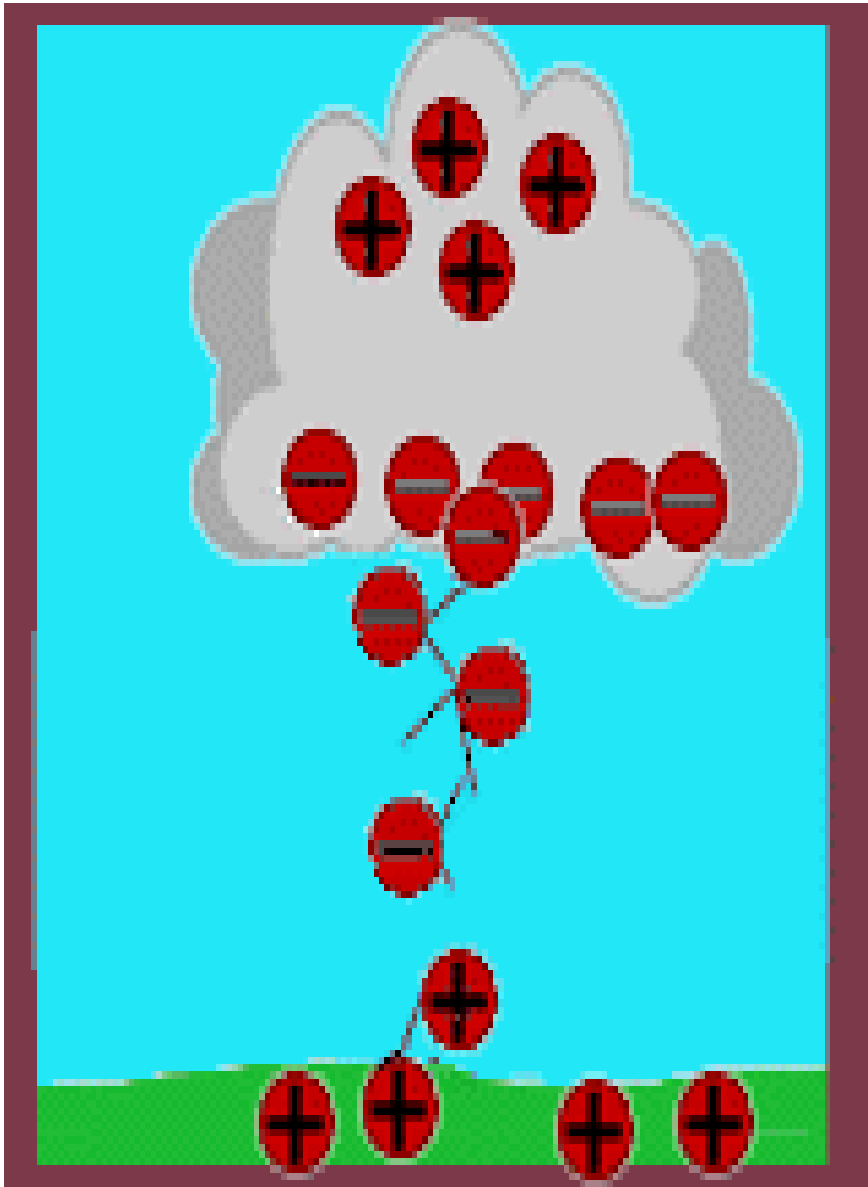
Lightning Formation

During thunderstorms strong updrafts cause molecules to bump together and their charges to separate

Negative charges concentrate at the base of the clouds

Lightning Formation

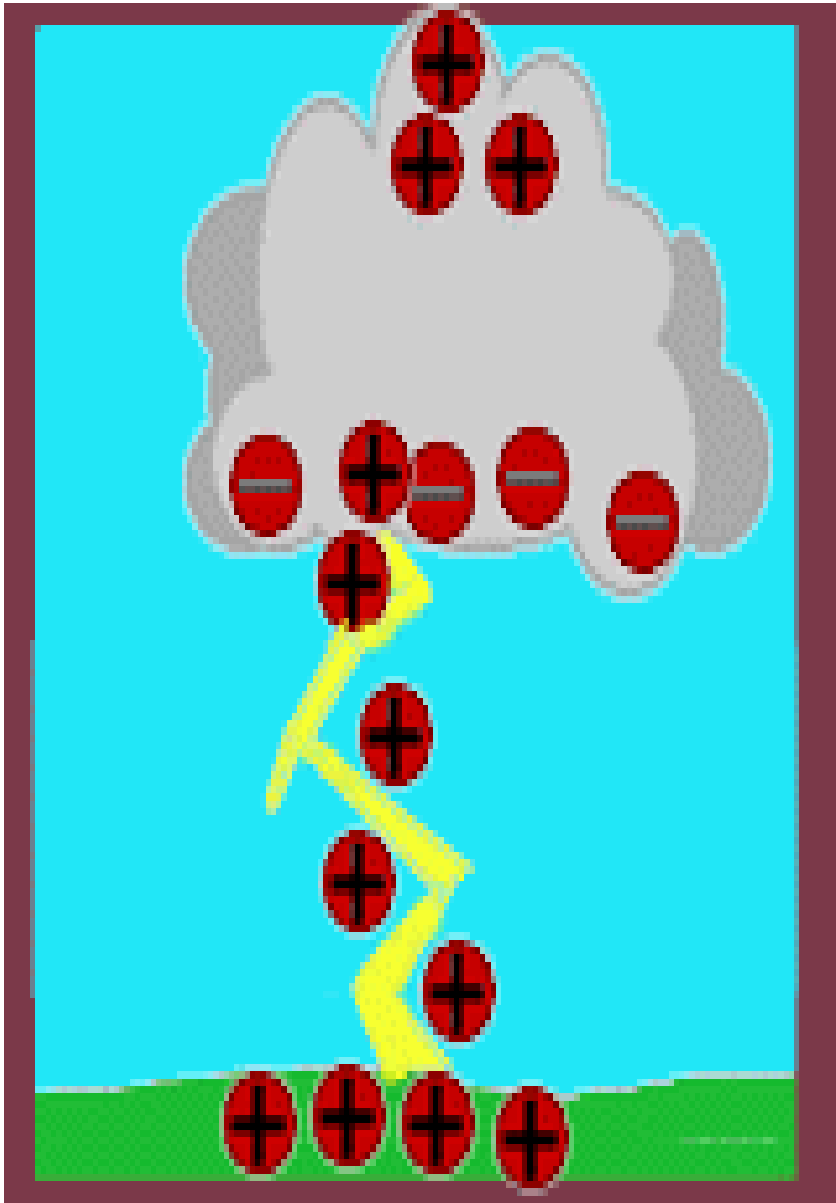
- The ground has lost electrons, giving it a positive (+) charge
- Opposites attract: The (-) from the cloud base is "pulled" to the (+)
- First downward movement of (-) is called a *leader*



Lightning Formation

When the (-) and (+) touch, they create a *conductive path* to the ground.

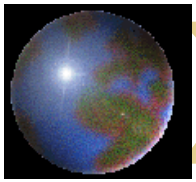
The other (-) rush down this path = ***lightning***



Lightning on L.Superior

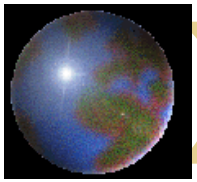
Lightning on L.Michigan

Lightning strike



Quiz Yourself!!

TRUE or FALSE

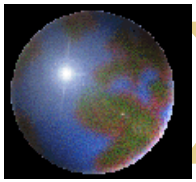


TRUE or FALSE?????

Cumulonimbus clouds can become thunderstorms

Stratus clouds produce sudden, severe thunderstorms and lightning

Lightning forms because of ***unequal*** charges

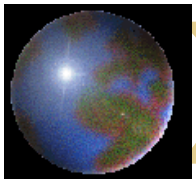


Tornadoes

A funnel shaped cloud that extends downward from a cumulonimbus cloud.

Called a tornado only once it hits the ground.

Winds inside travel at up to 800km per hour in counterclockwise direction.



Hurricanes

- Caused by a warm, vertical wind interacting with an existing storm and causing the storm to turn inward and spiral.
- Wind speeds of up to 300km per hour.
- Hurricanes grow as more moist air rises into it.
- Severe winds rotate around a calm, low pressure zone in the middle, which is the eye of the storm.