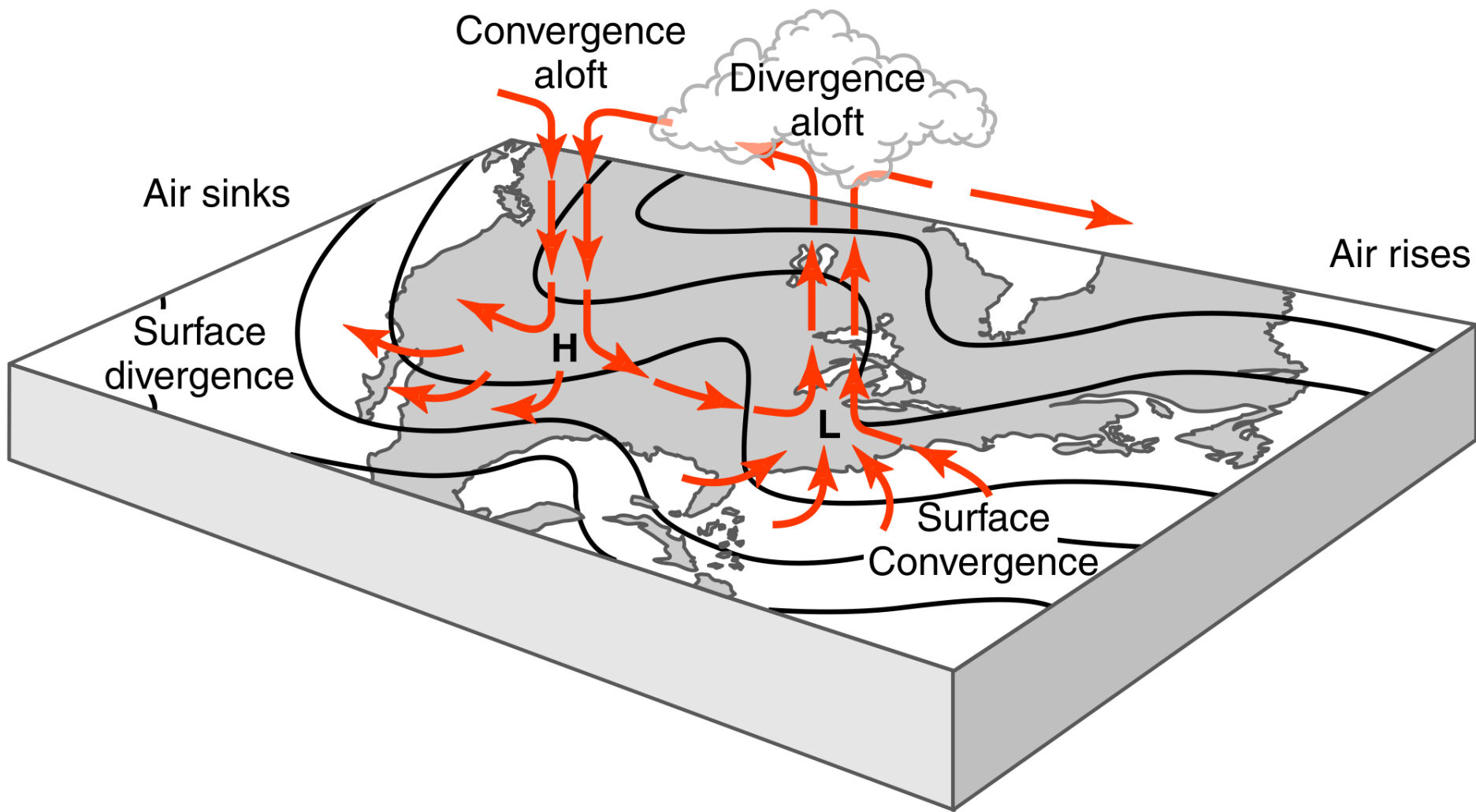


Air Masses & Fronts

Goal: Students will analyze wind patterns on a global scale.

A closer look at wind.

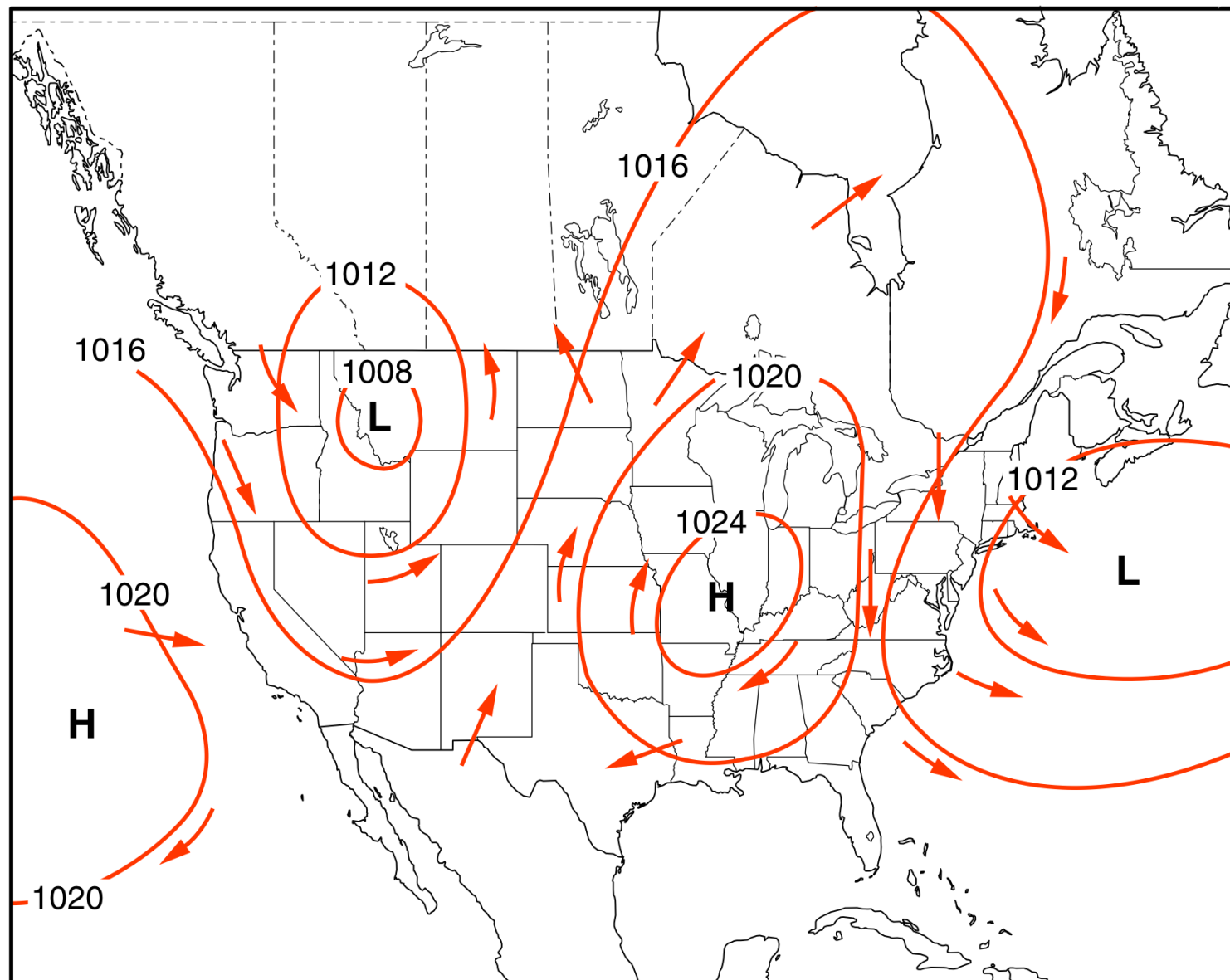




Convergence – when air comes together (**LOW** pressure).

Divergence – when air spreads apart (**HIGH** pressure).

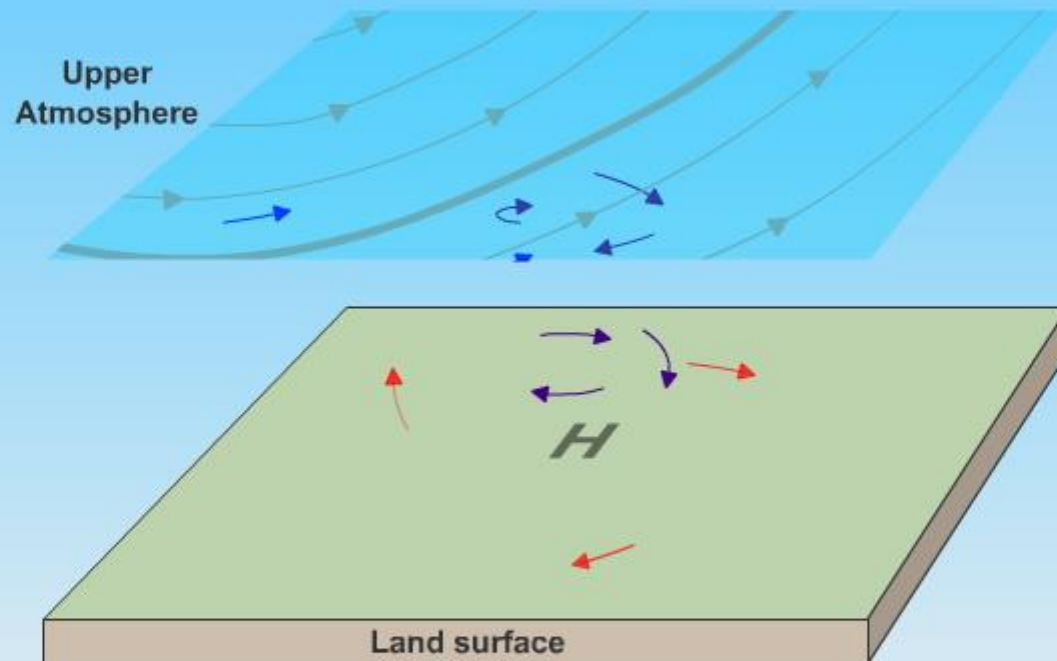
Goal: Students will analyze wind patterns on a global scale.



Key

H Pressure center 1008 Isobars Wind direction

Anticyclone - Northern Hemisphere



Cyclone

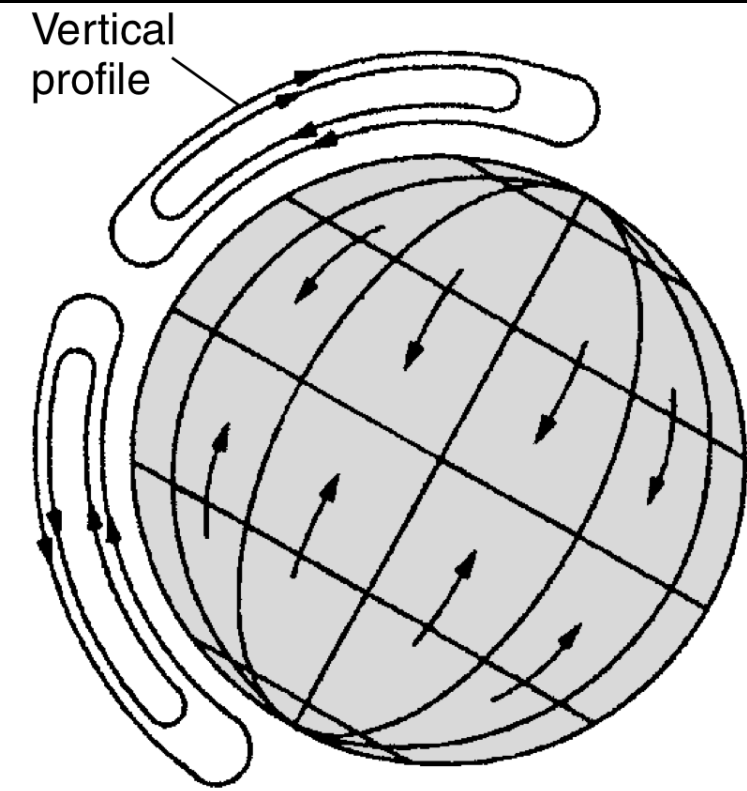
Anticyclone

Both

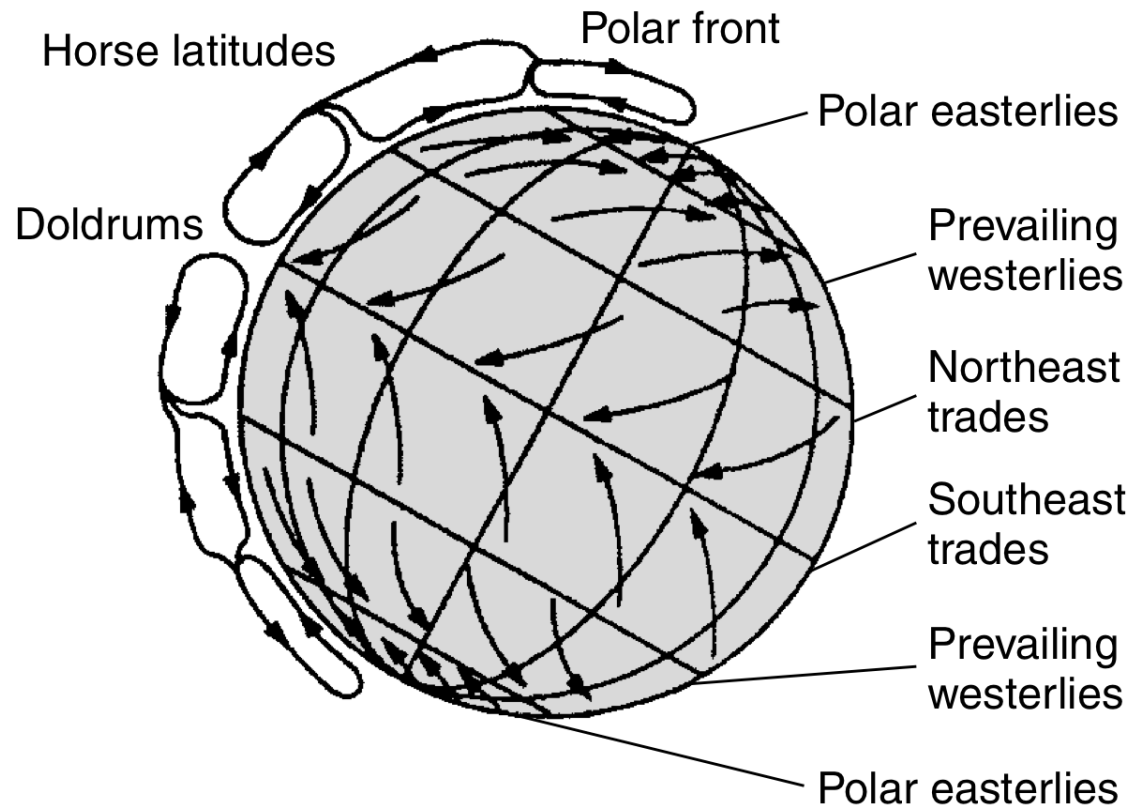
Labels Off

The Coriolis Effect

1. Causes objects traveling along the surface of Earth to appear to travel in a curved path.



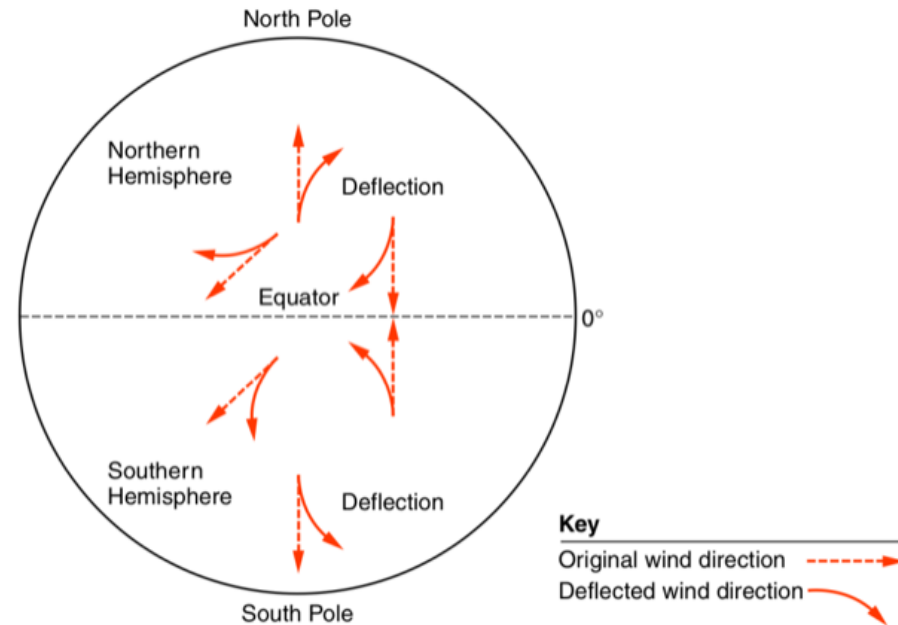
A. Stationary Planet

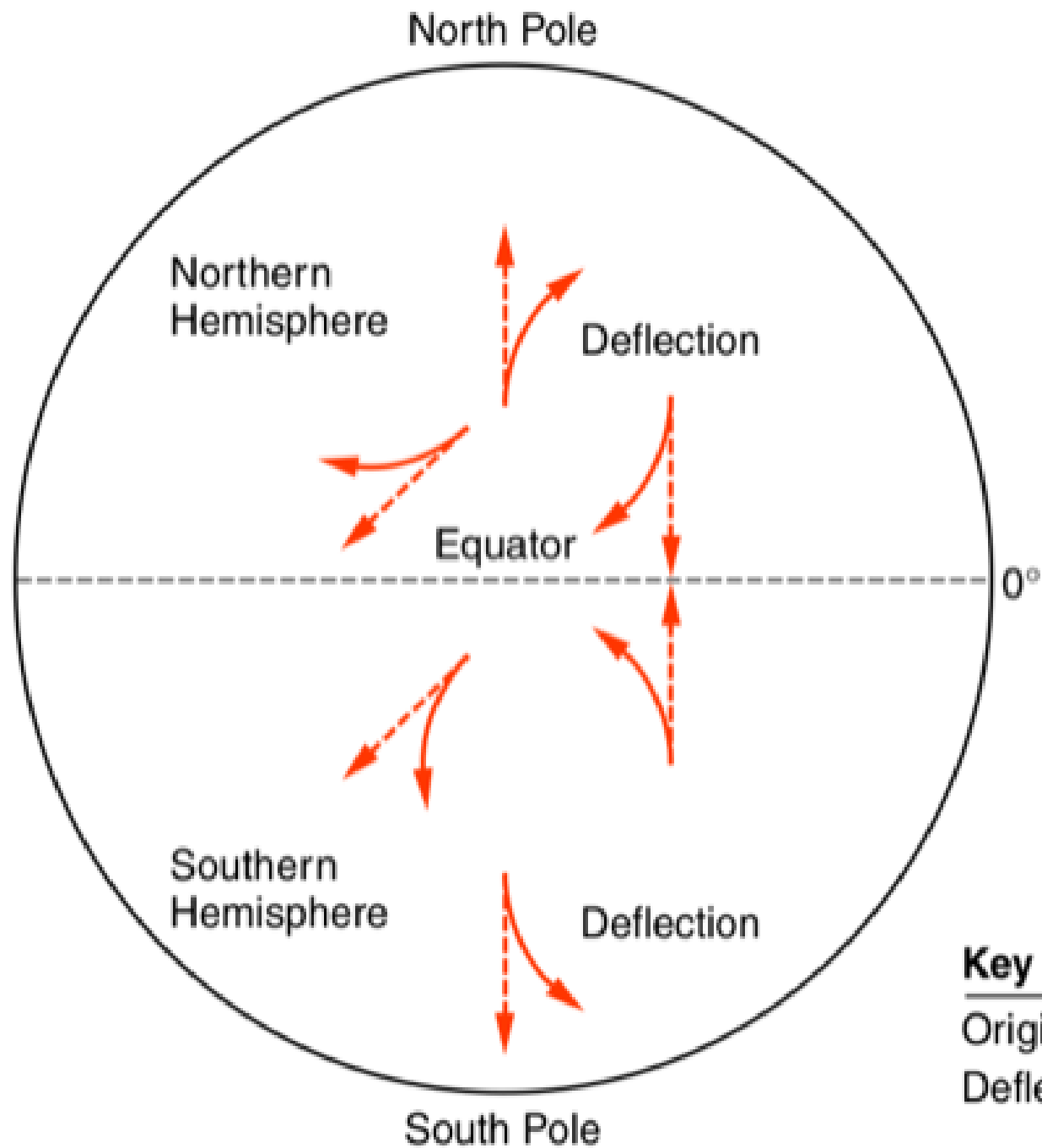


B. Rotating Earth

The Coriolis Effect

2. Objects appear to bend to the right in the Northern Hemisphere.
3. Objects appear to bend to the left in the Southern Hemisphere.
4. Due to Earth's ROTATION



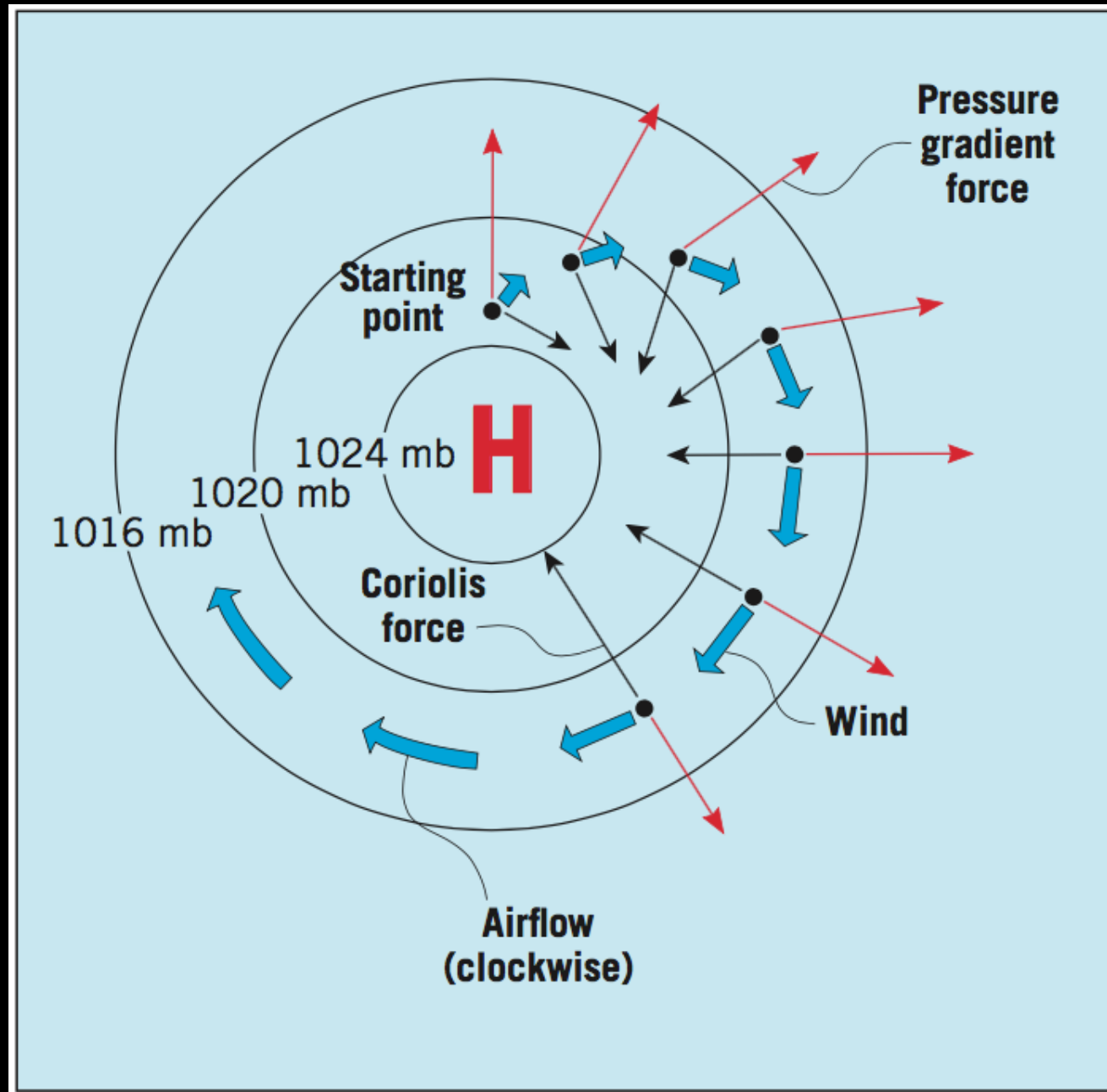


Key

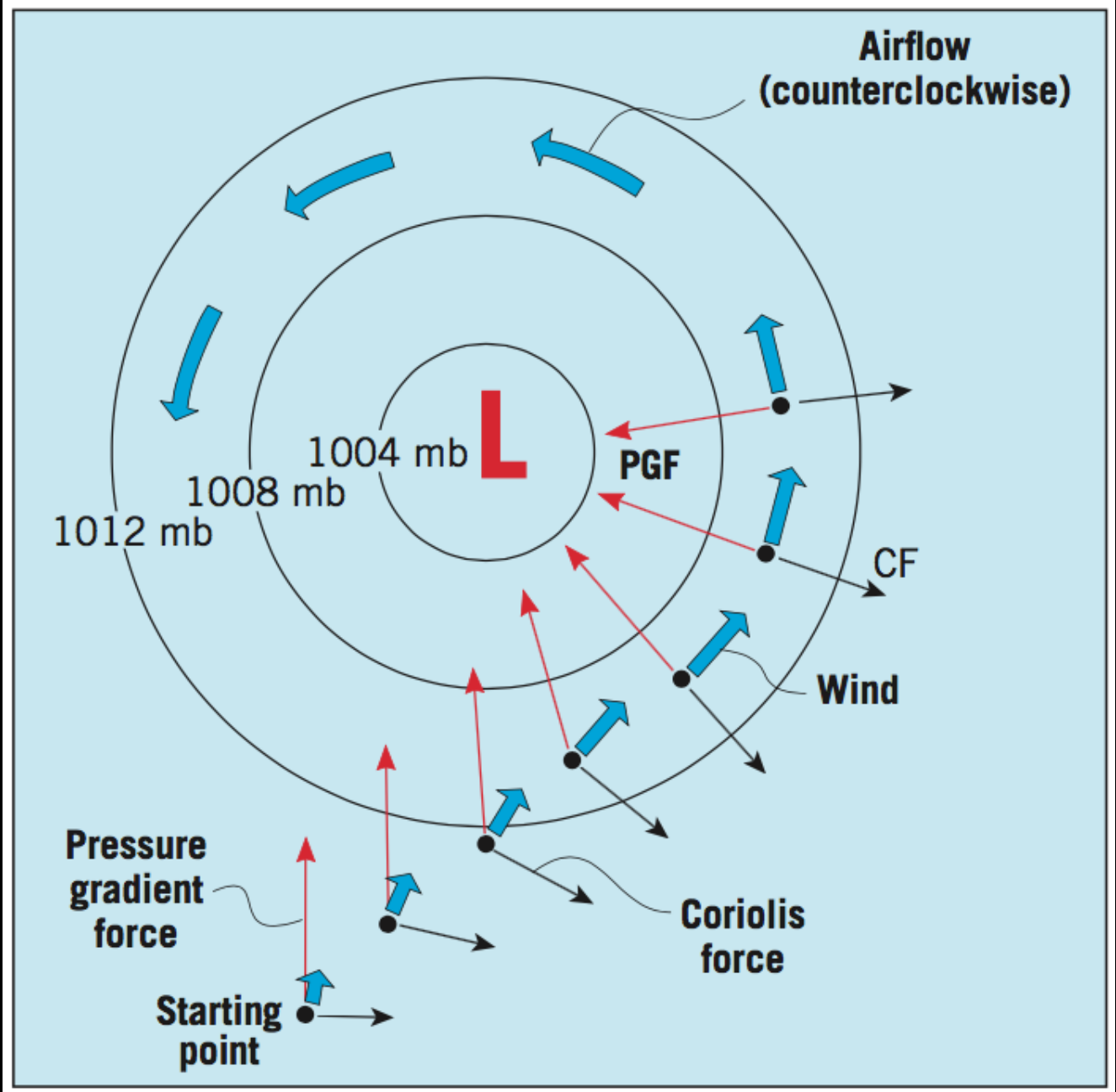
Original wind direction 

Deflected wind direction 

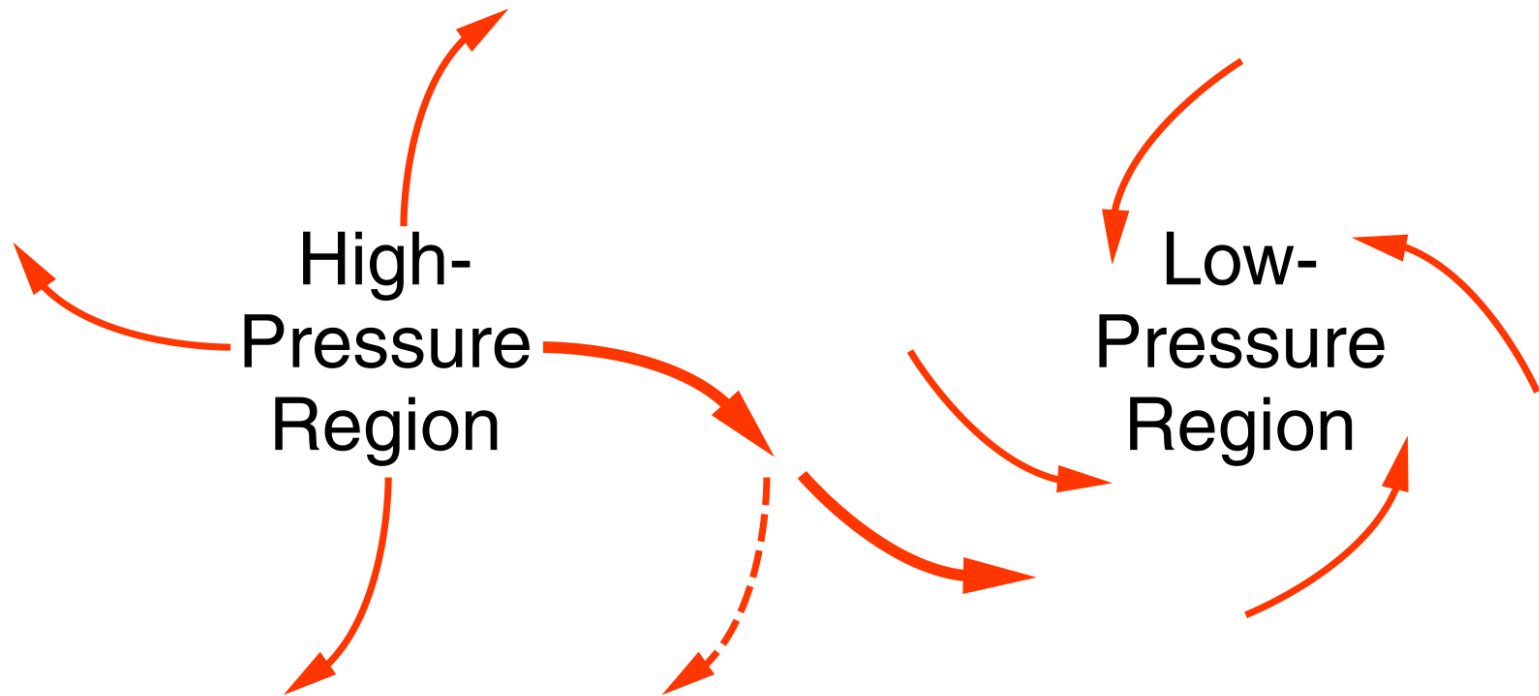
Goal: Students will analyze wind patterns on a global scale.



Goal: Students will analyze wind patterns on a global scale.

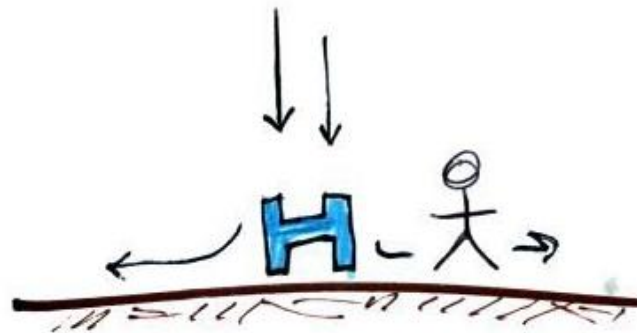
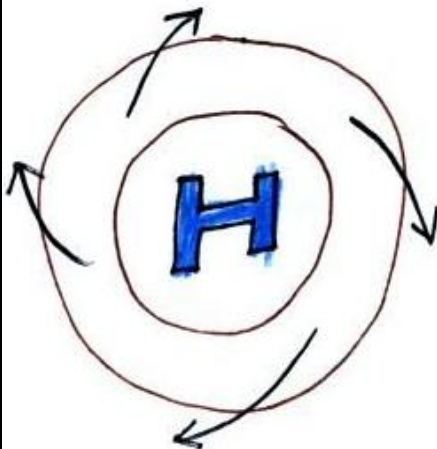
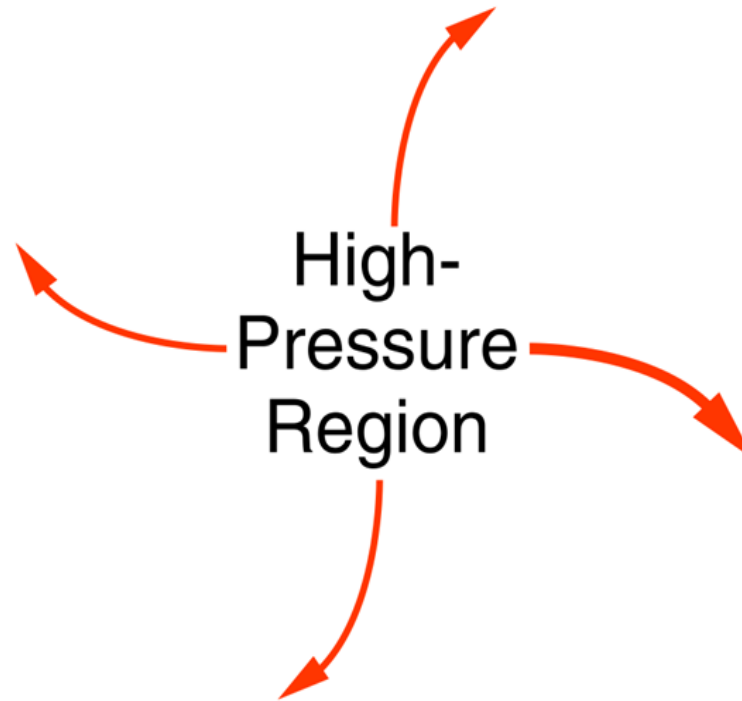


High and Low Pressure Systems



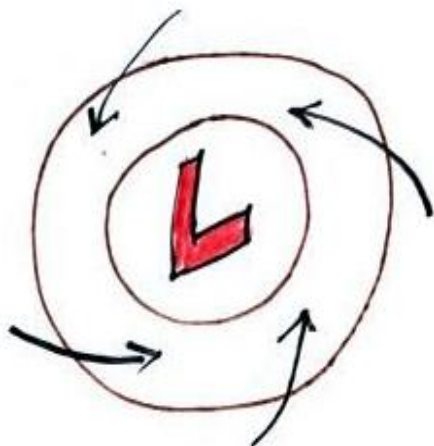
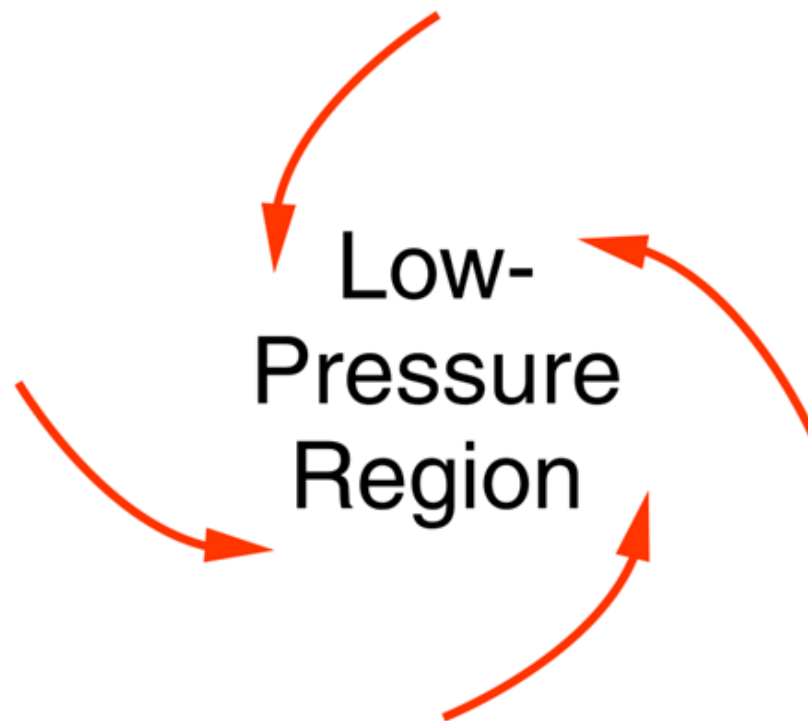
High Pressure System (ANTICYCLONE)

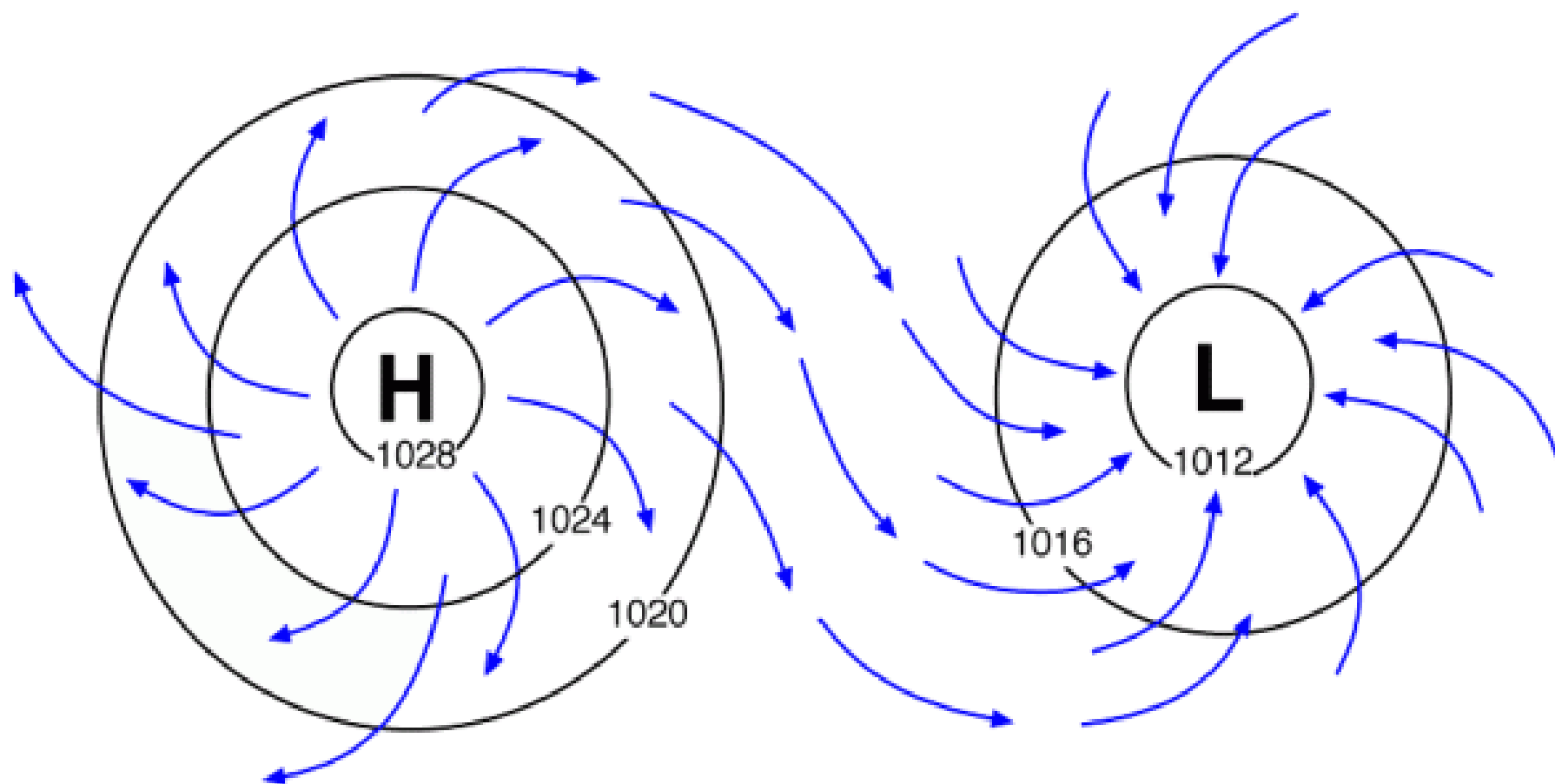
1. Air sinks in the upper atmosphere.
2. Rotates CLOCKWISE
3. Flows OUTWARD at the surface of the Earth.
4. GOOD weather.



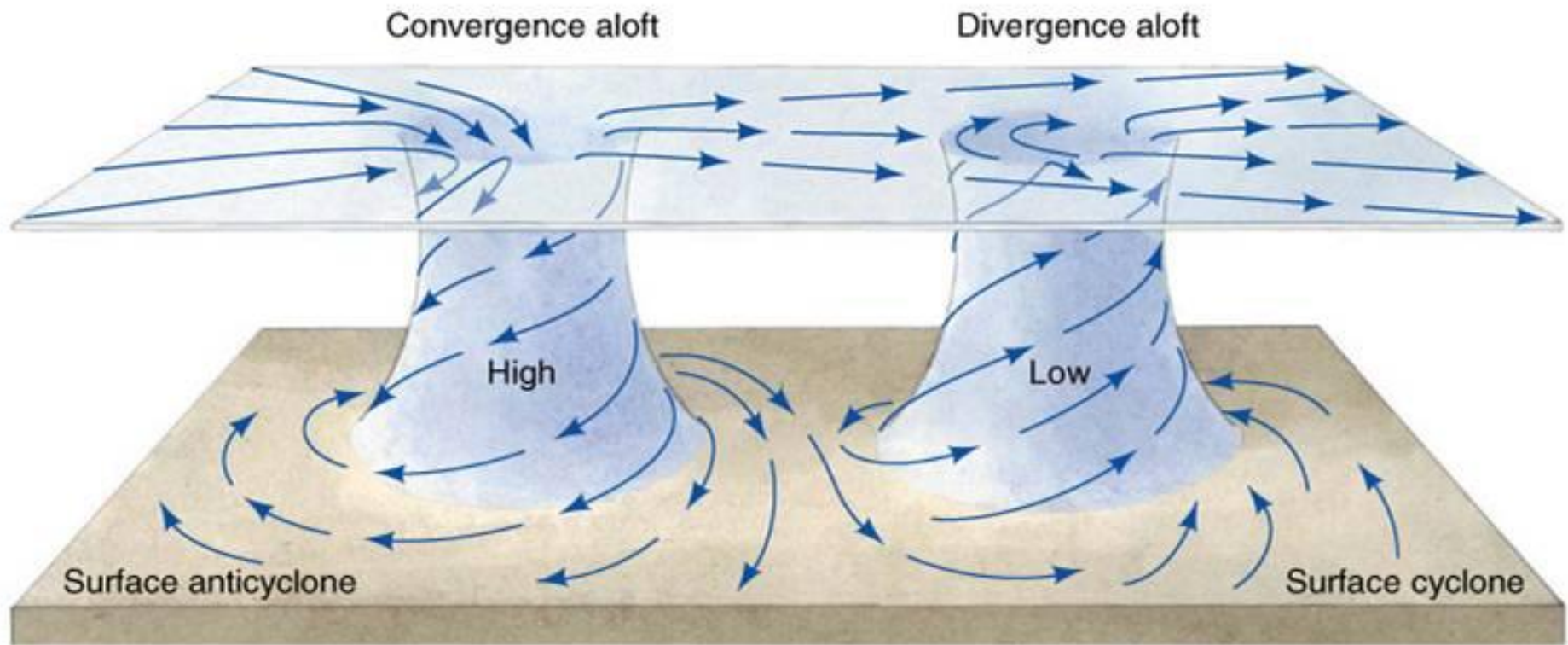
Low Pressure System: (CYCLONE)

1. Flows **INWARD** at the surface of the Earth.
2. Air **RISES** rises at the surface in the center of the LOW.
3. Rotates **COUNTER CLOCKWISE**
4. **BAD** weather.

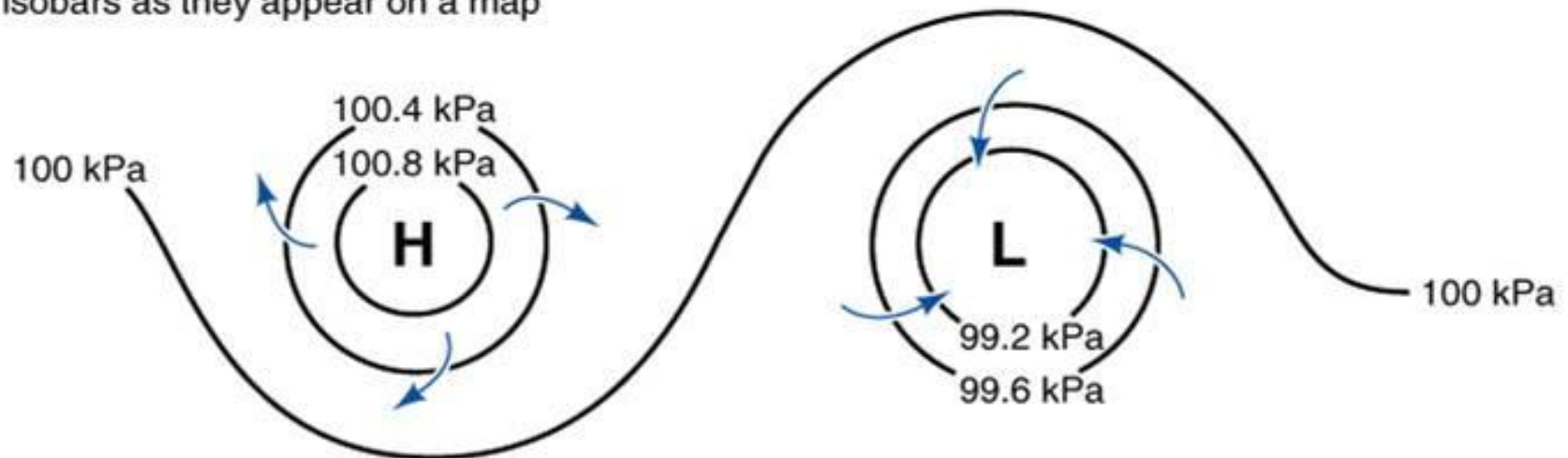




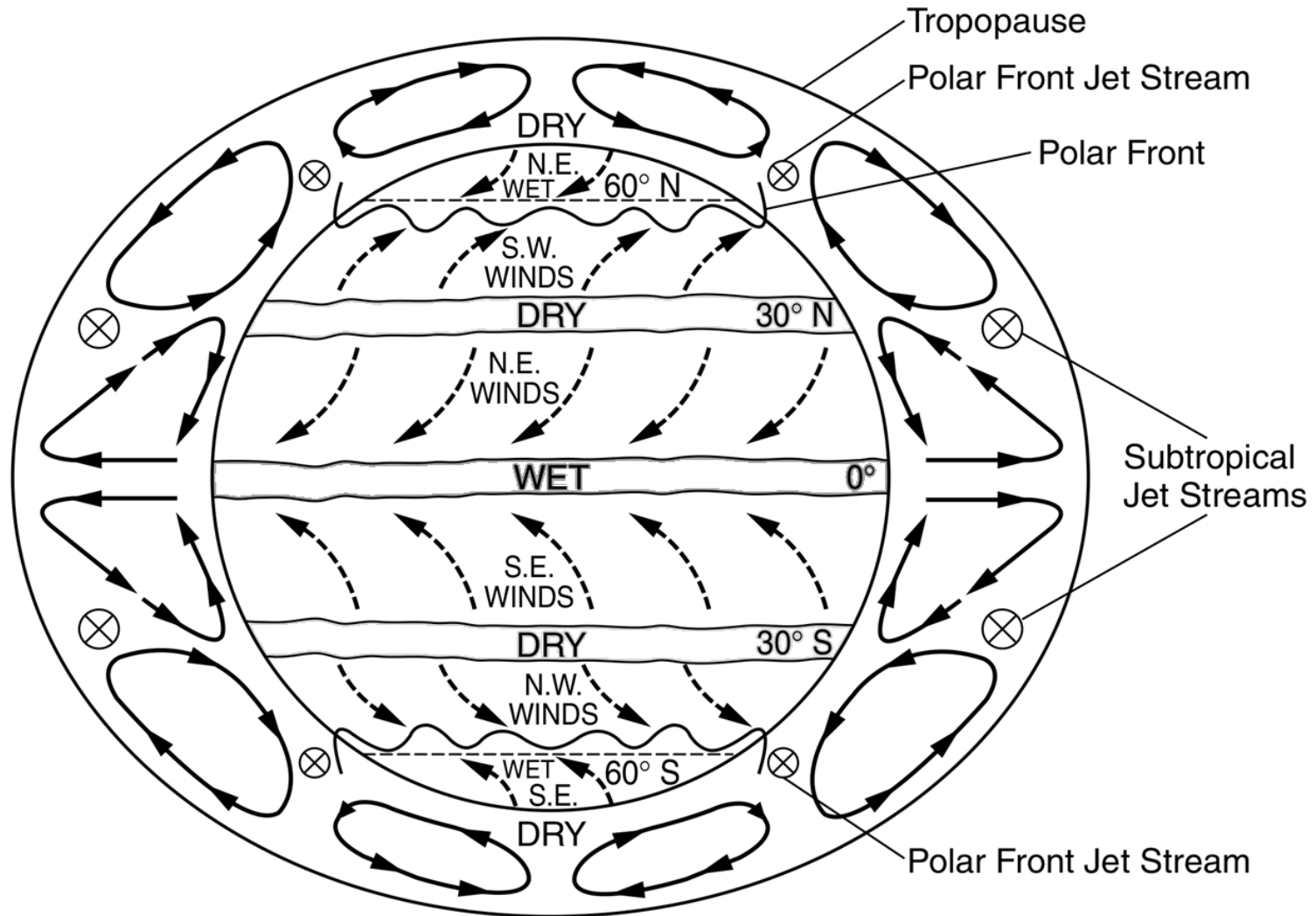
A high pressure and a low pressure center with wind directions (northern hemisphere).
Circles are isobars with pressure in mb.



Surface isobars as they appear on a map

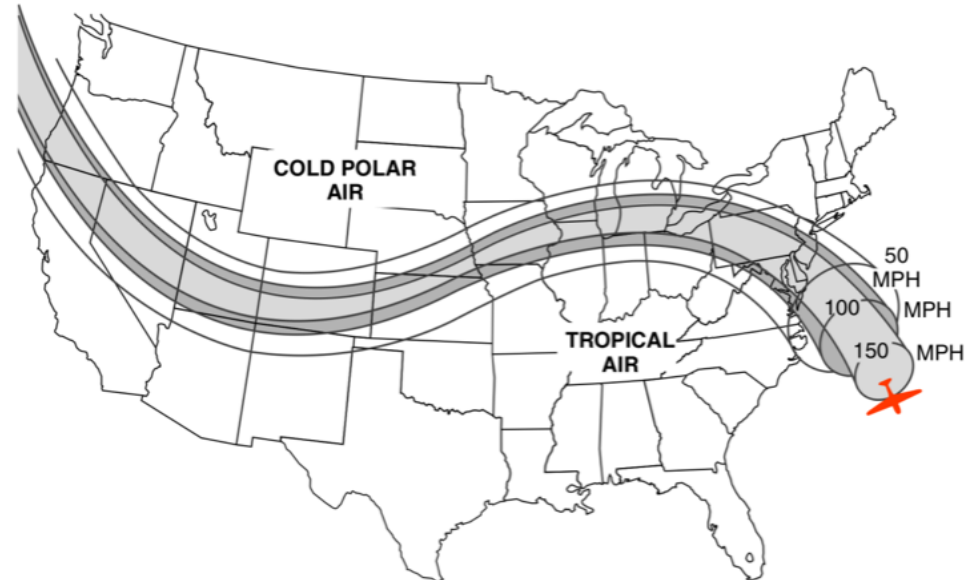
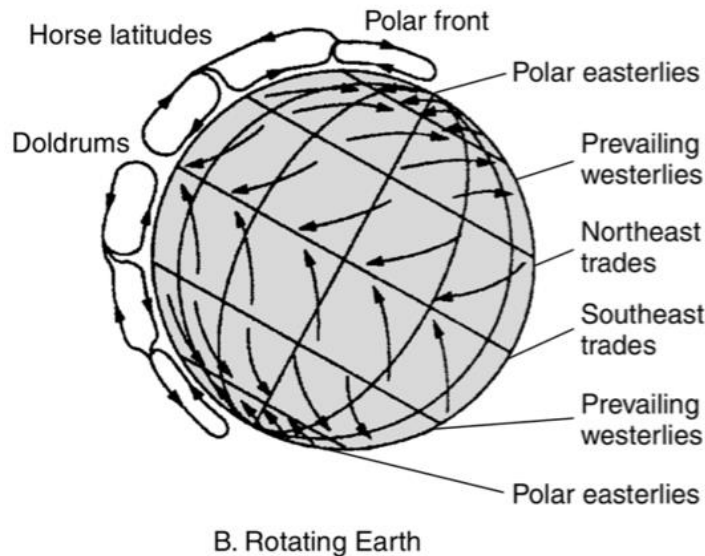


Planetary Winds



Planetary Winds

1. **Prevailing winds** – refer to the most common wind direction and speed at a particular location and time of year.



2. are caused by the unequal heating of the Earth's surface (and the resulting differences in air pressure)

a. cool air is more dense and sinks while warm air is less dense and rises

b. heat circulates by convection

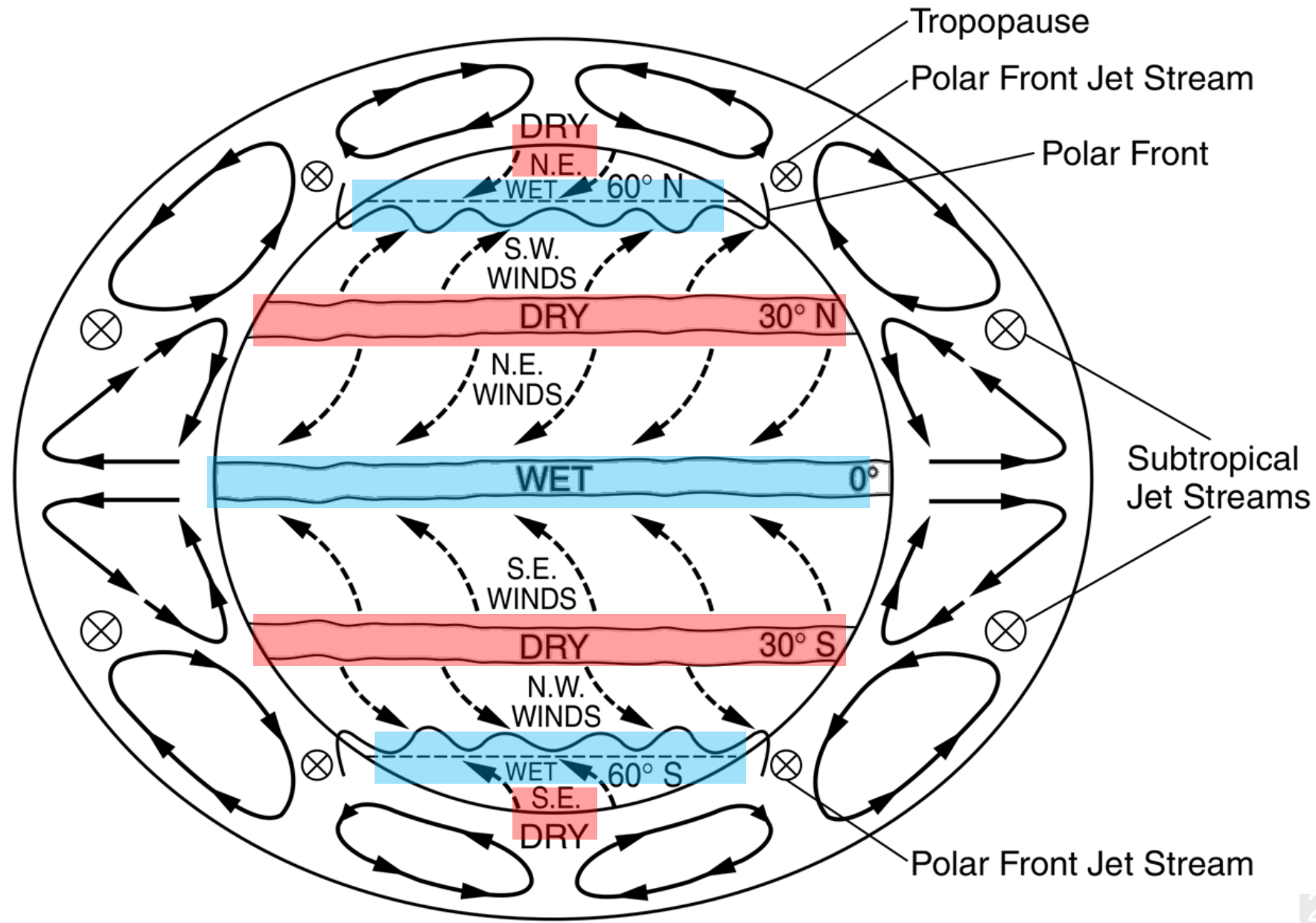
c. this circulation produces convection cells at various latitudes around the Earth

d. heat is transferred throughout the atmosphere by this process

3. This creates ZONES:

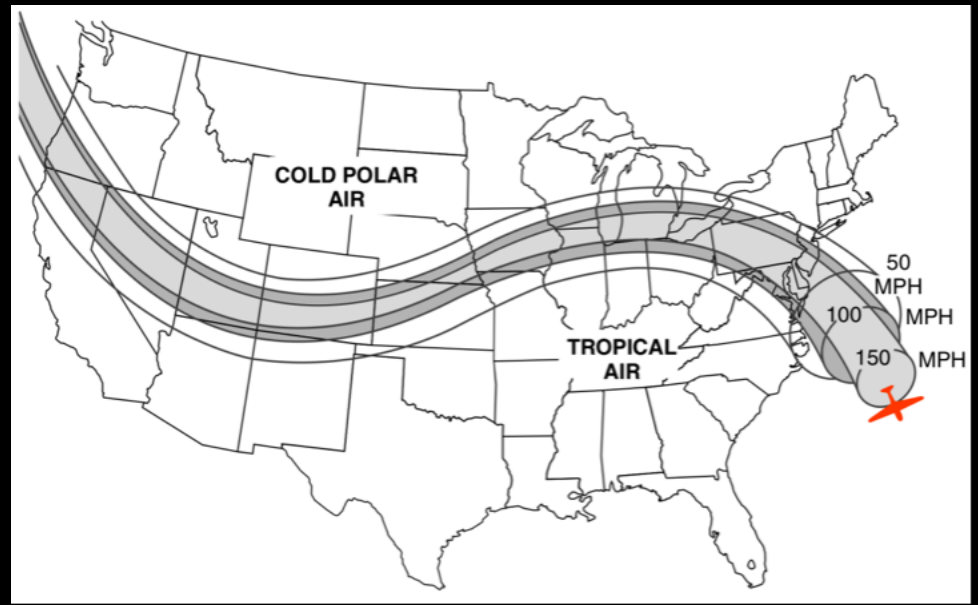
- a. LOWS are located at 0° (Equator), and 60° N and 60° S
- b. rain forests are often found along low pressure zones where air rises and forms clouds
- c. HIGHS are located at 30° N and 30° S, 90° N and 90° S
- d. deserts are found along high pressure zones where air sinks and becomes dry

Goal: Students will analyze wind patterns on a global scale.



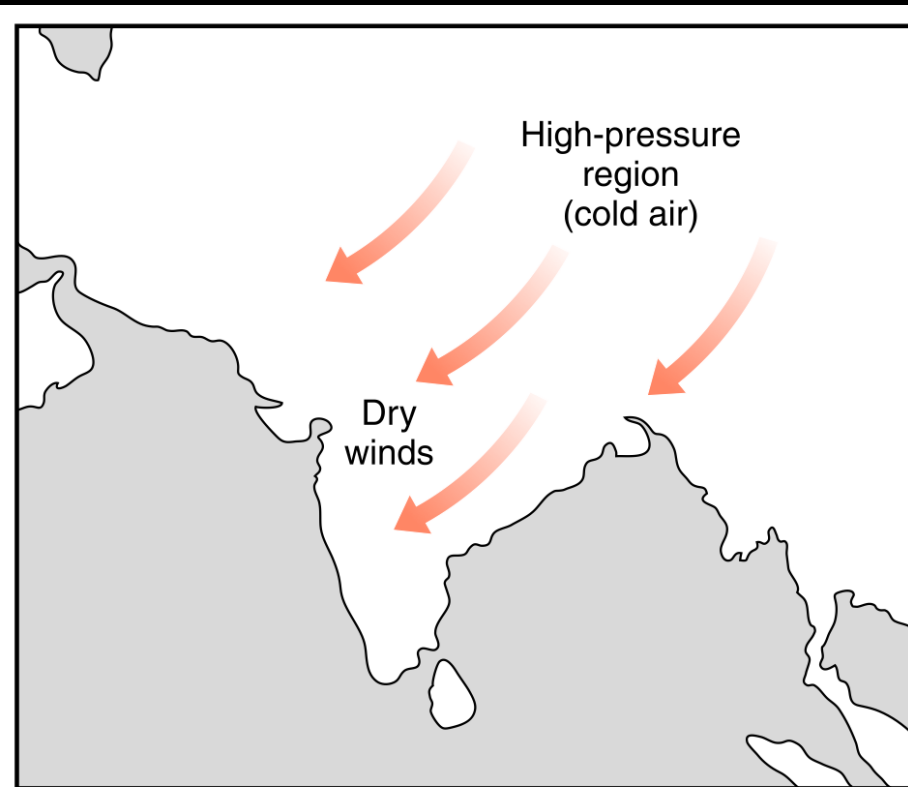
Jet Streams – bands of easterly moving air at the top of the troposphere

- a. the jet stream often separates cold air found at high latitudes from warm air found at low latitudes
- b. winds blow at ~200 mph
- c. very important in the formation and movement of low pressure systems

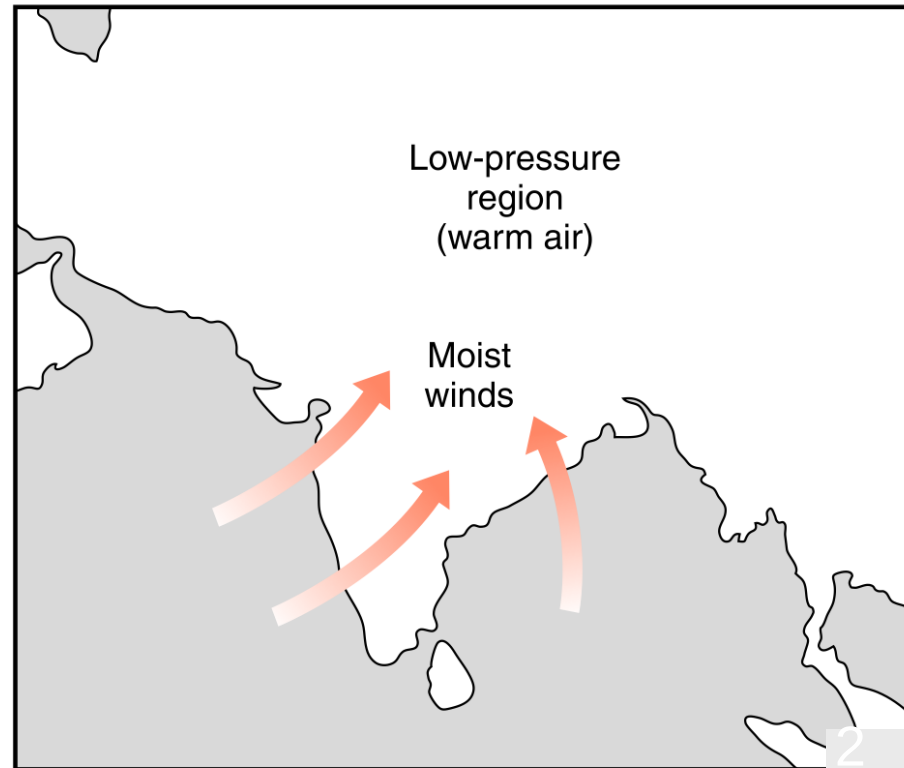


Monsoons

A seasonal direction of wind. Can last for months and move over great distances.



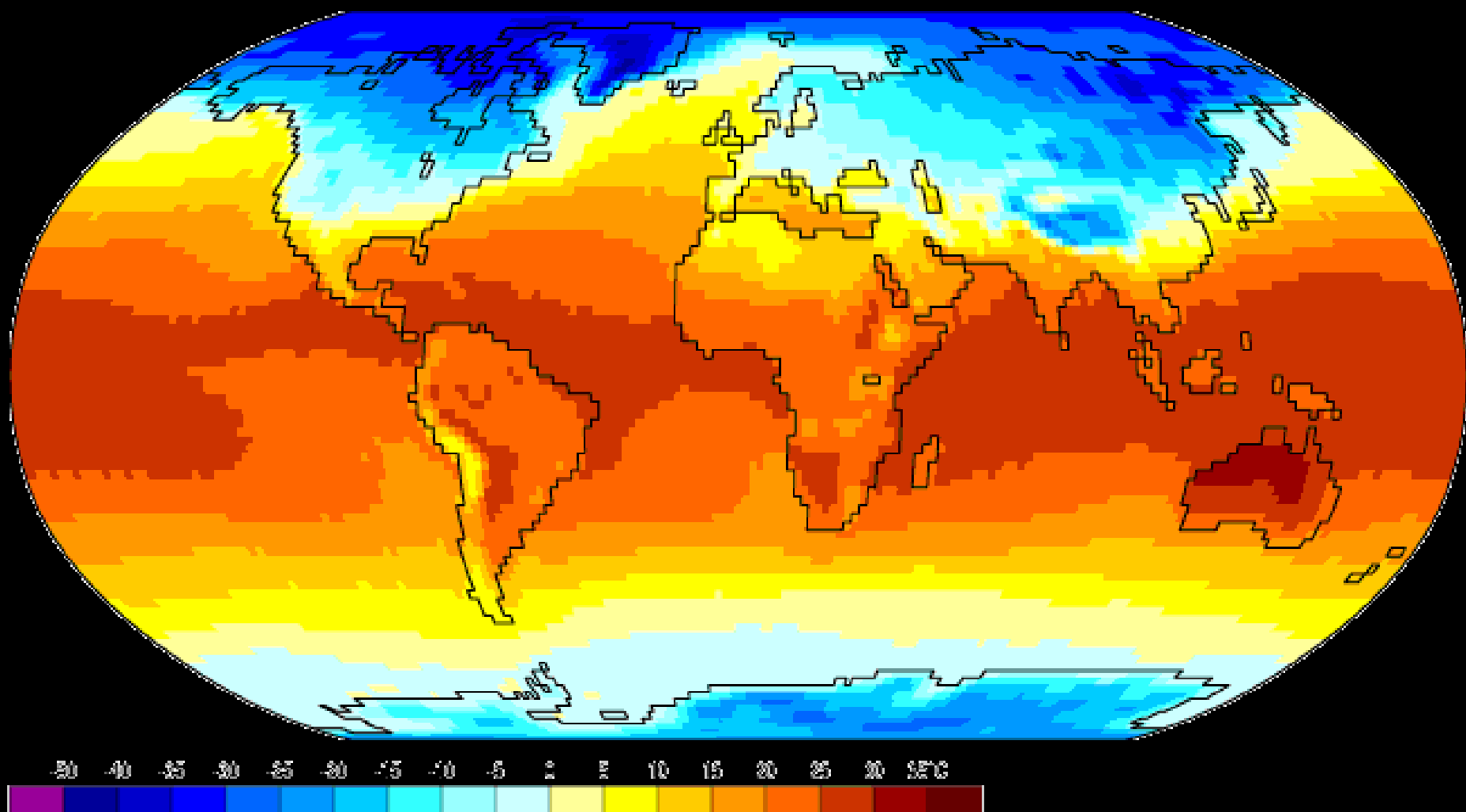
Winter Monsoon



Summer Monsoon

Air Temperature

Dec



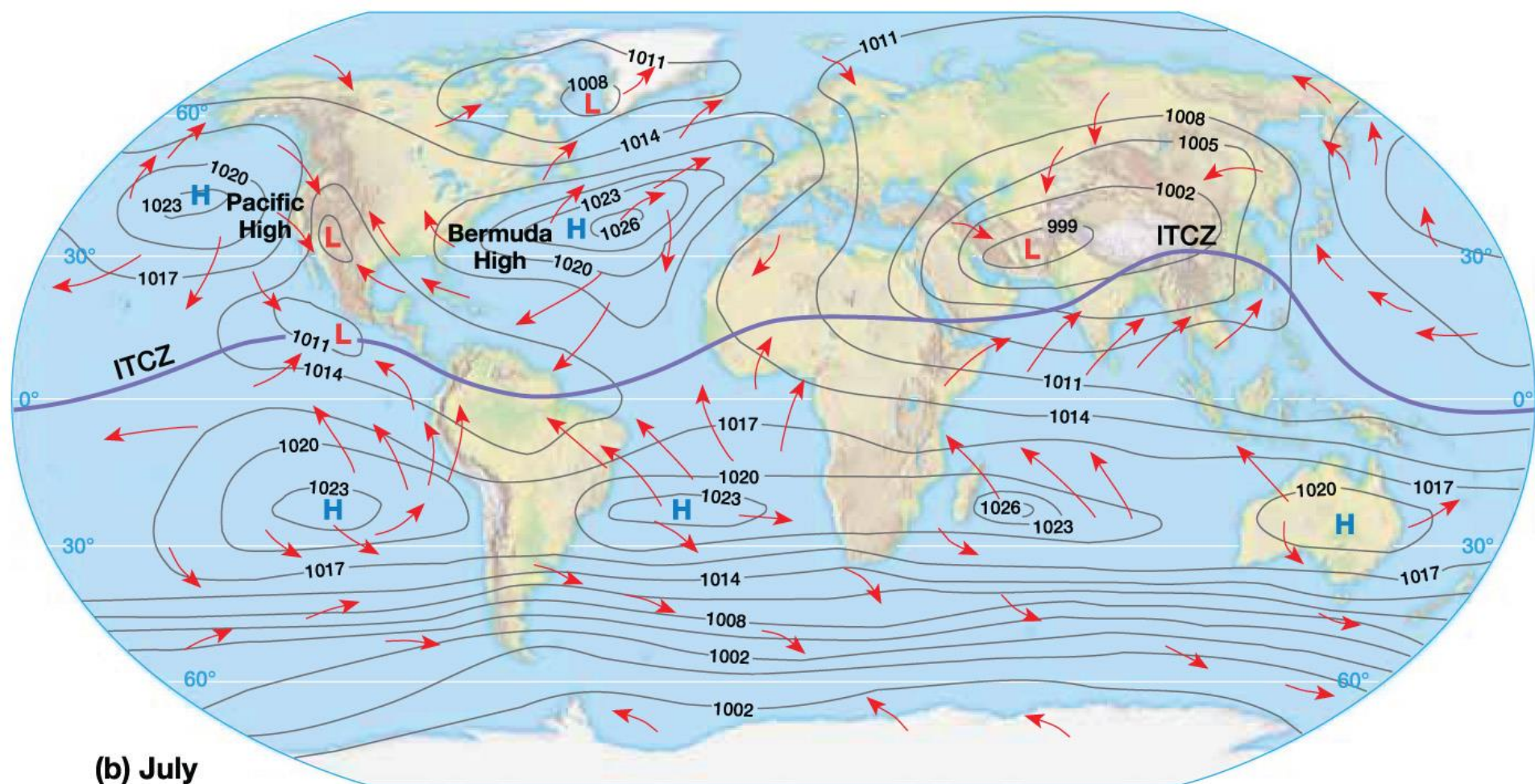
Data: RCEPACAR Reanalysis Project, 1950-1997 climatology
Animation: Department of Geography, University of Oregon, March 2000

23



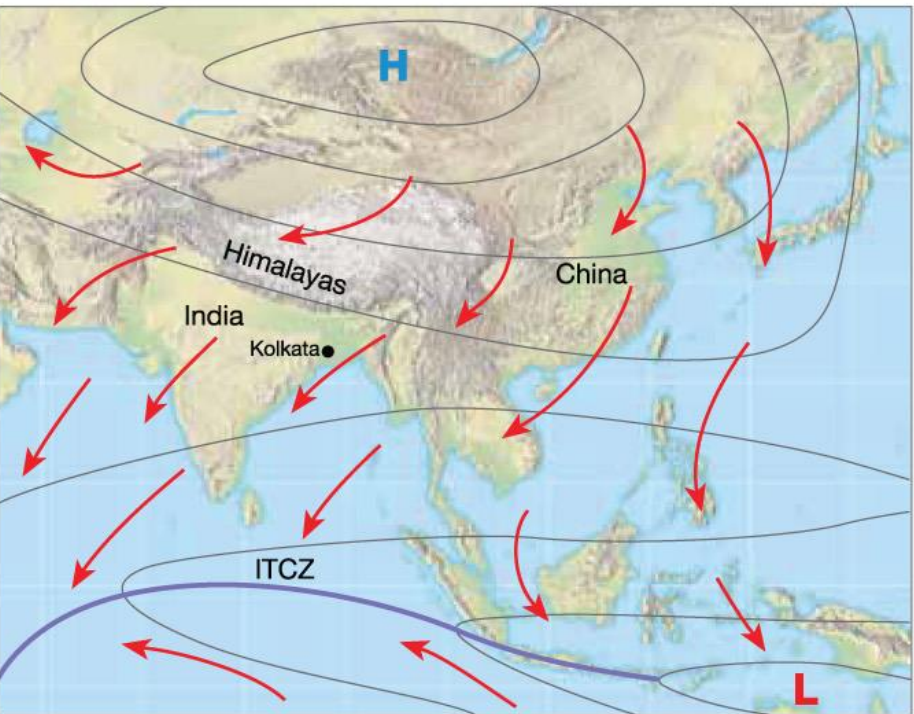
23

Goal: Students will analyze wind patterns on a global scale.

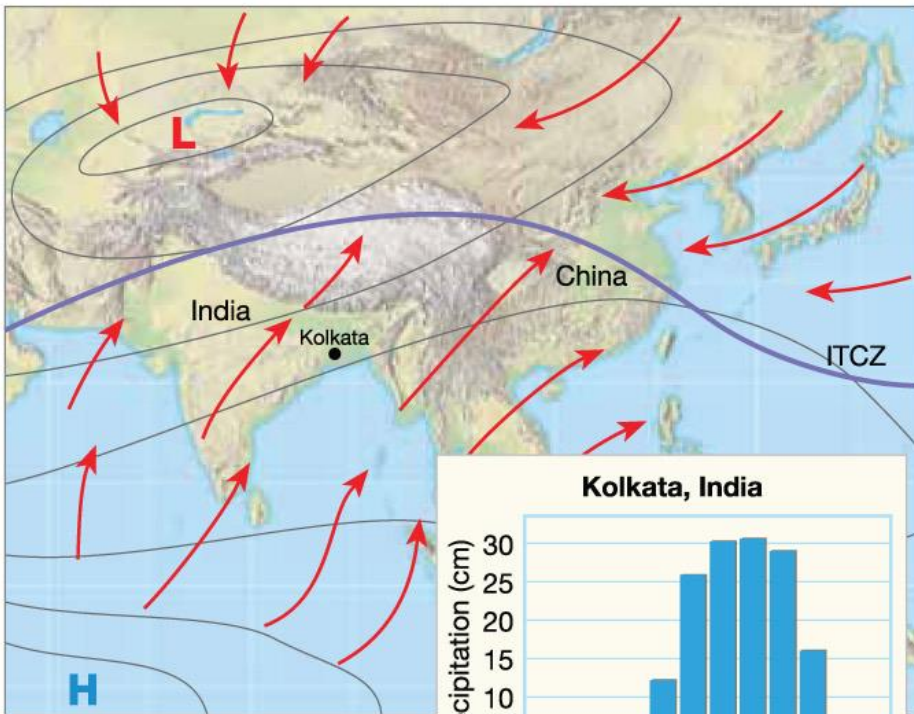


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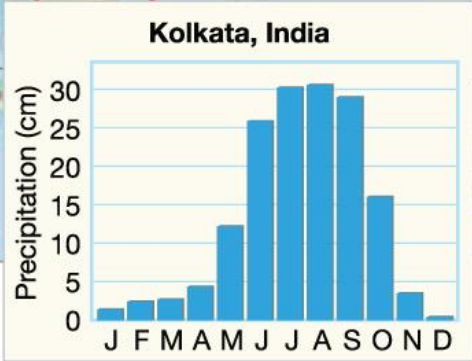
Goal: Students will analyze wind patterns on a global scale.



(a) Winter monsoon

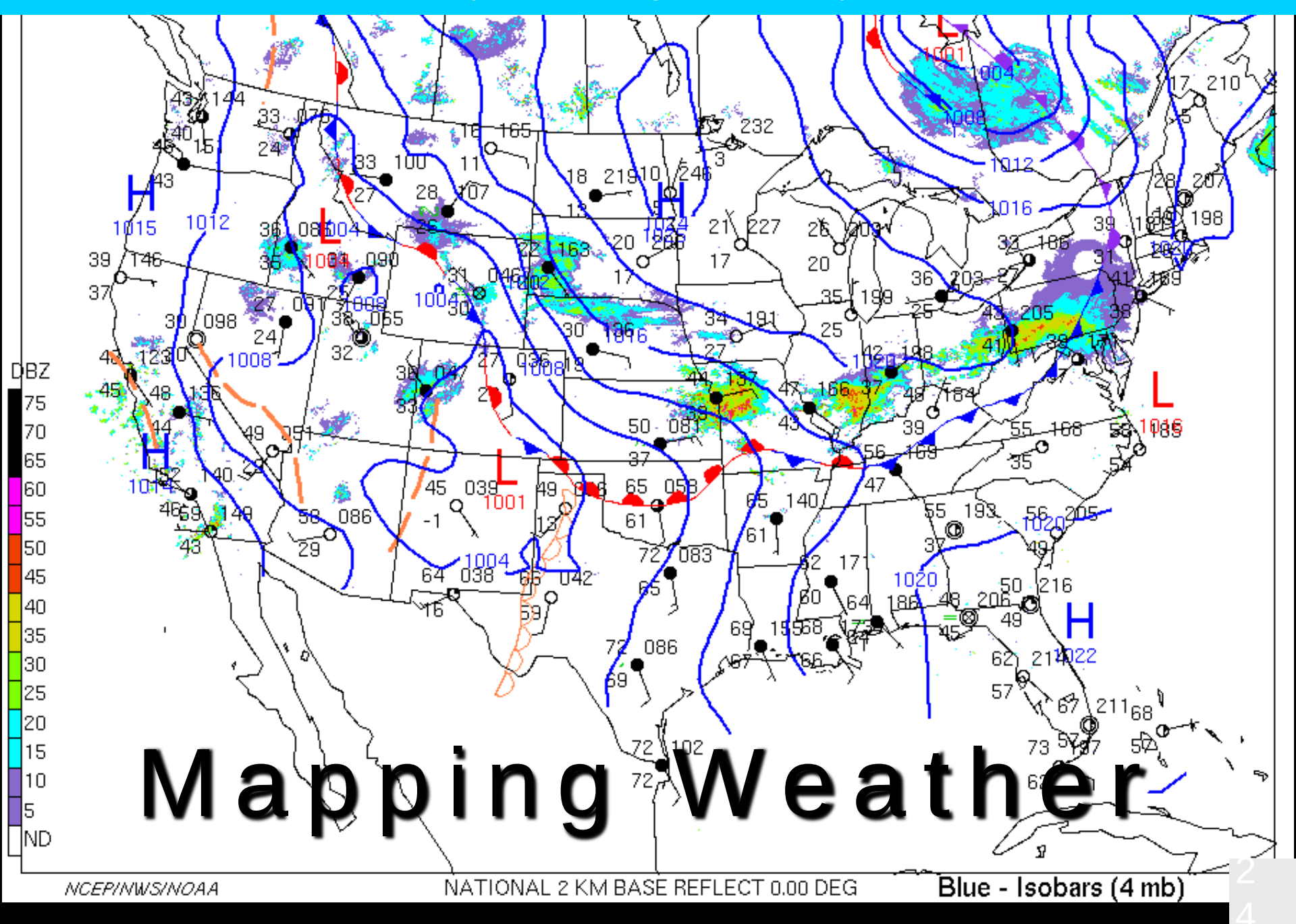


(b) Summer monsoon



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Goal: Students will discover and practice using weather maps.



Why map weather?

Mapping weather makes it easier to forecast weather, as well making it easier to visualize what is happening in the atmosphere at various locations.

Data is collected all over the world, and placed on maps to make it easy to understand.

Air Masses

1. A large body of air in the troposphere with similar characteristics of
 - a. temperature
 - b. moisture
 - c. air pressure

Source Region — A geographic region where an air mass forms

- a. We can infer where an air mass came from based on its characteristics.
- b. An air mass will take on the characteristics of the surface over which it forms.

Air Masses TYPES / Descriptions:

a. Describing Temperature

- Tropical – originate at low latitudes (tropics) - high temperatures
- Polar – originate at high latitudes (polar) - low temperatures
- Arctic – originates over polar regions - extremely cold

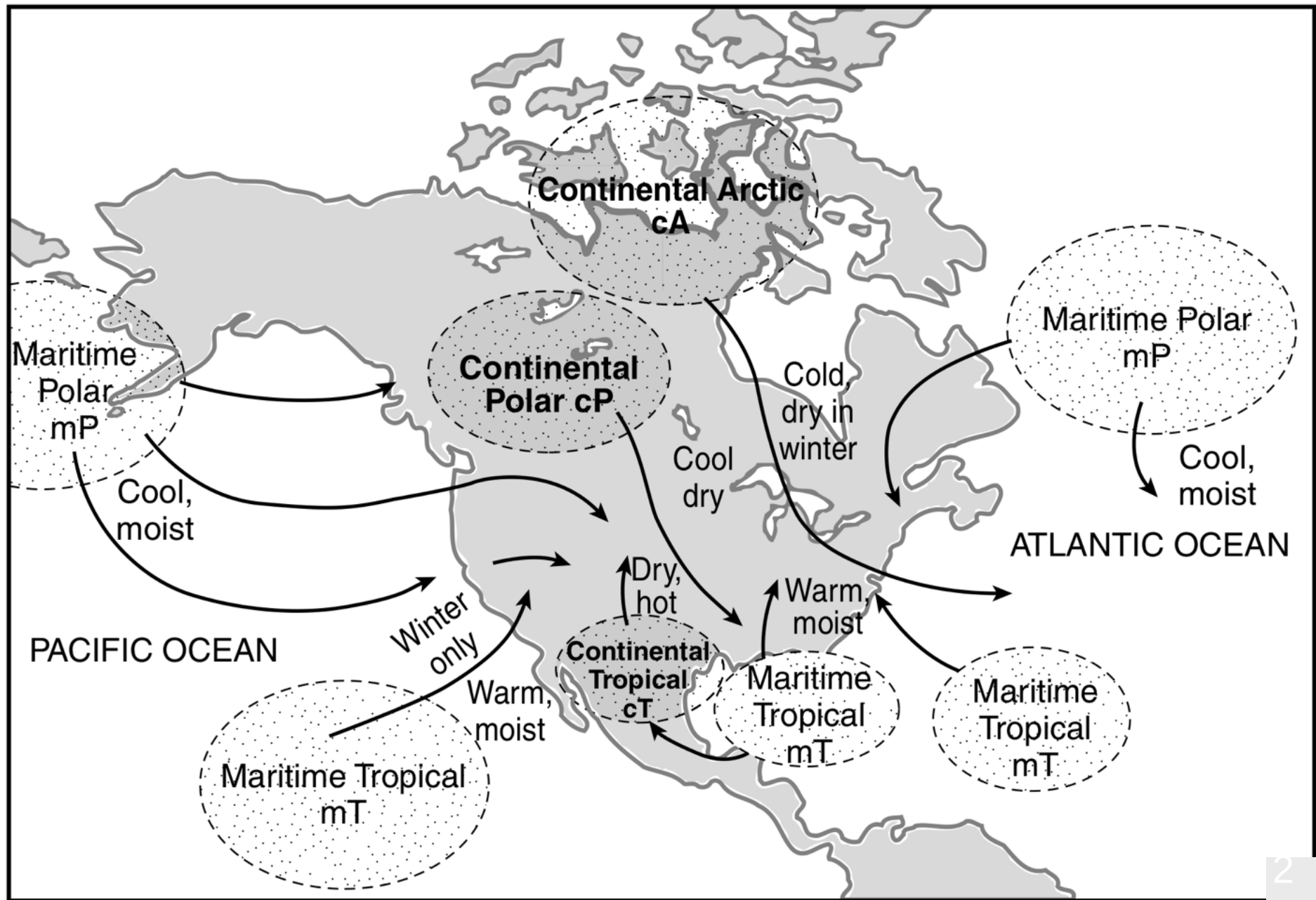
a. Describing Humidity

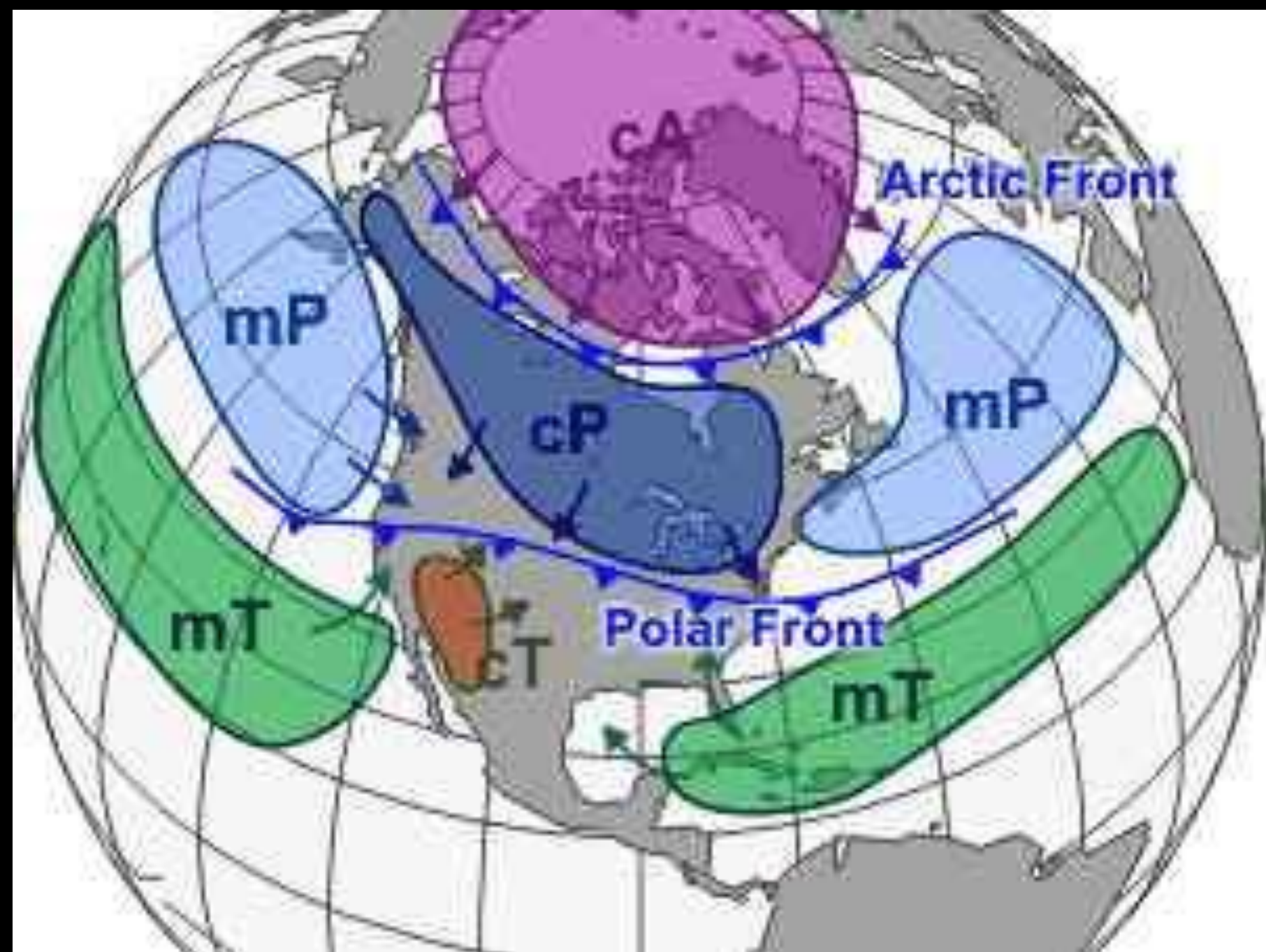
- **Continental** – originate over land – dry
- **Maritime** – originate over water – wet

4. Air Mass Codes

- a. mT – maritime tropical – warm and moist.
- b. cT – continental tropical – warm and dry.
- c. mP – maritime polar – cold and moist
- d. cP – continental polar – cold and dry
- e. cA – continental arctic – extremely cold
and dry

Goal: Students will explain what air masses are and where they form.

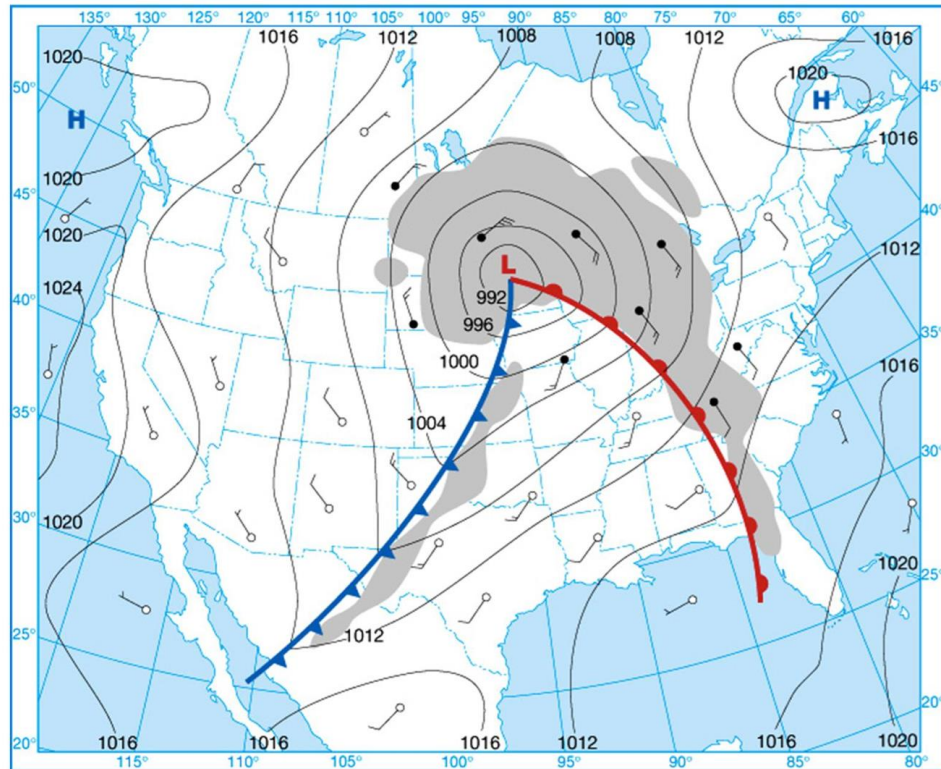




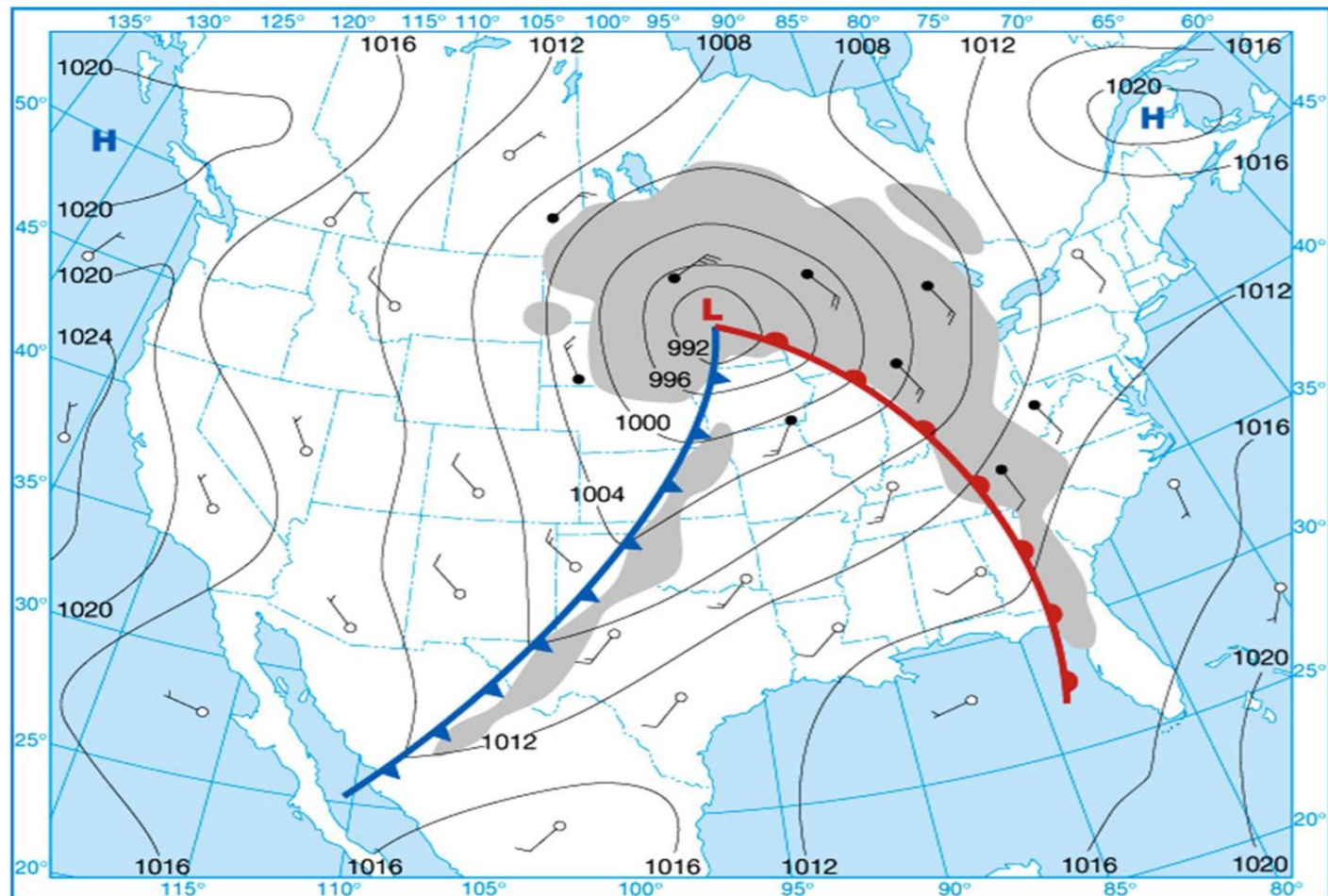
Weather Fronts

Weather fronts always occur at the boundaries between warm and **cold** air.

The only difference between different weather fronts is which **direction** the boundary is moving.



Air Masses	Front Symbols	Hurricane
cA continental arctic	Cold	
cP continental polar	Warm	
cT continental tropical	Stationary	
mT maritime tropical	Occluded	
mP maritime polar		



Air Masses

cA continental arctic
 cP continental polar
 cT continental tropical
 mT maritime tropical
 mP maritime polar

Front Symbols

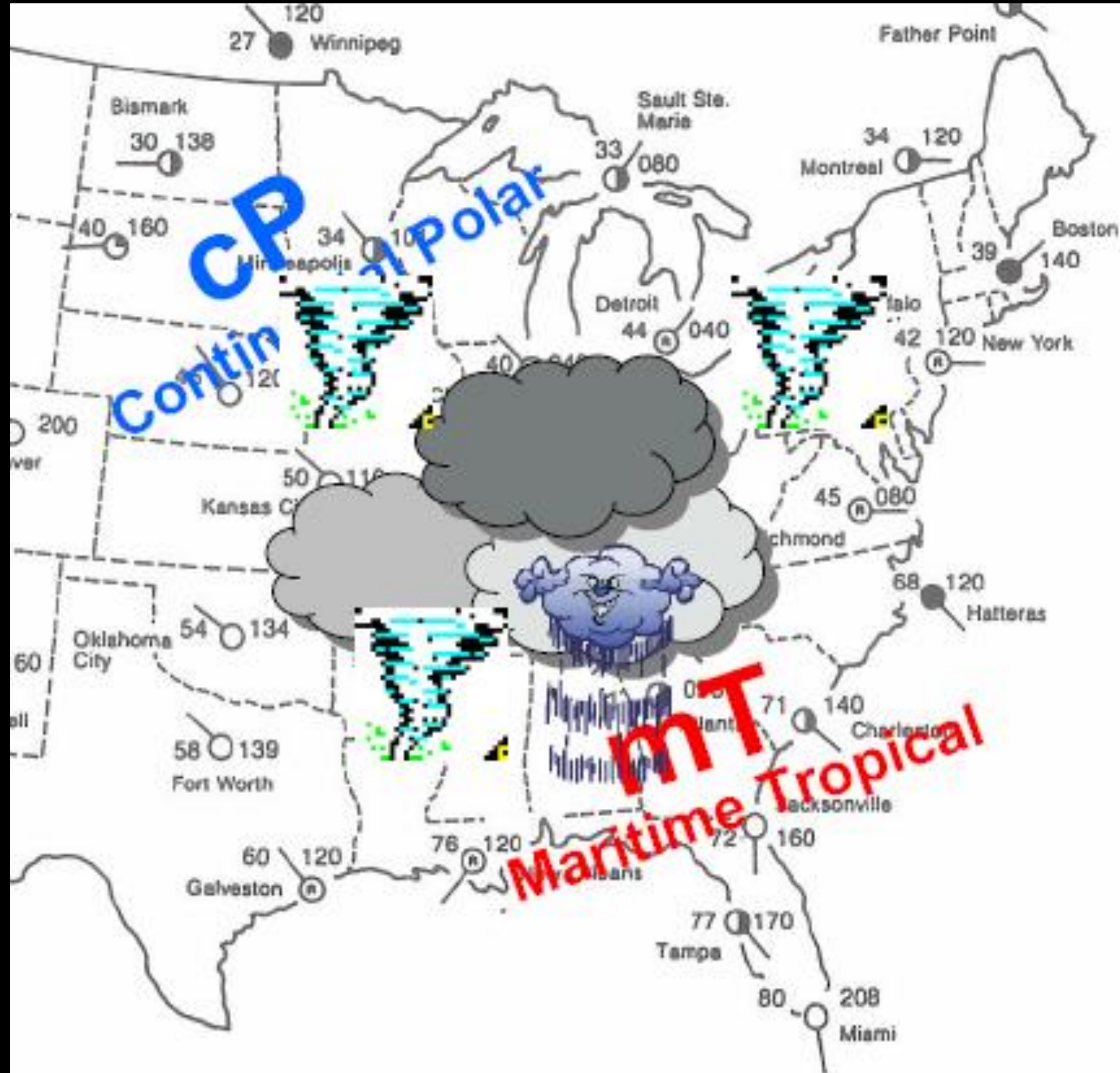
Cold 
 Warm 
 Stationary 
 Occluded 

Hurricane



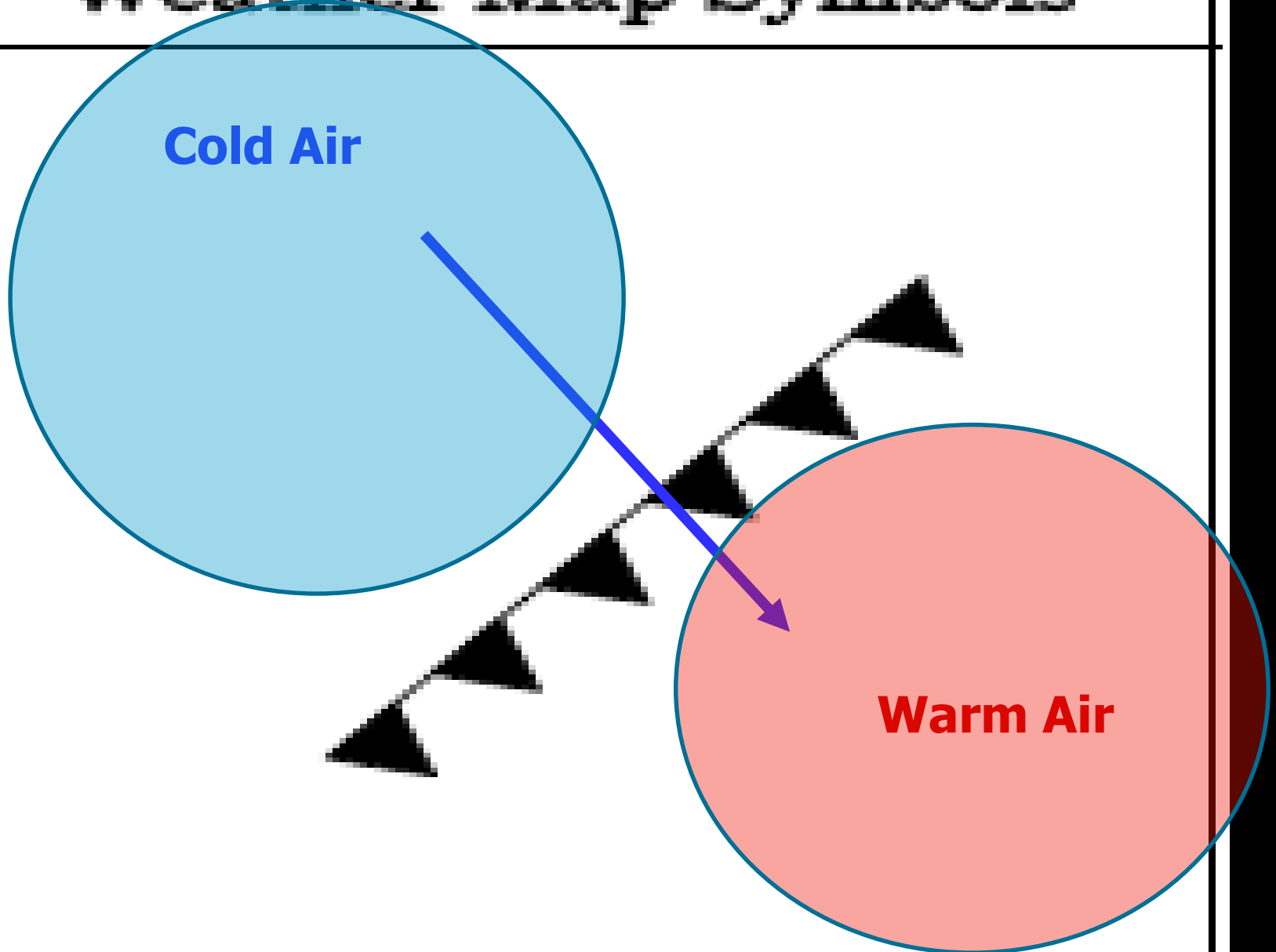
Fronts ESRT pg. 13

- 1. The boundary between 2 Air Masses.**
- 2. Usually produces precipitation.**
- 3. Violent weather can sometimes occur.**



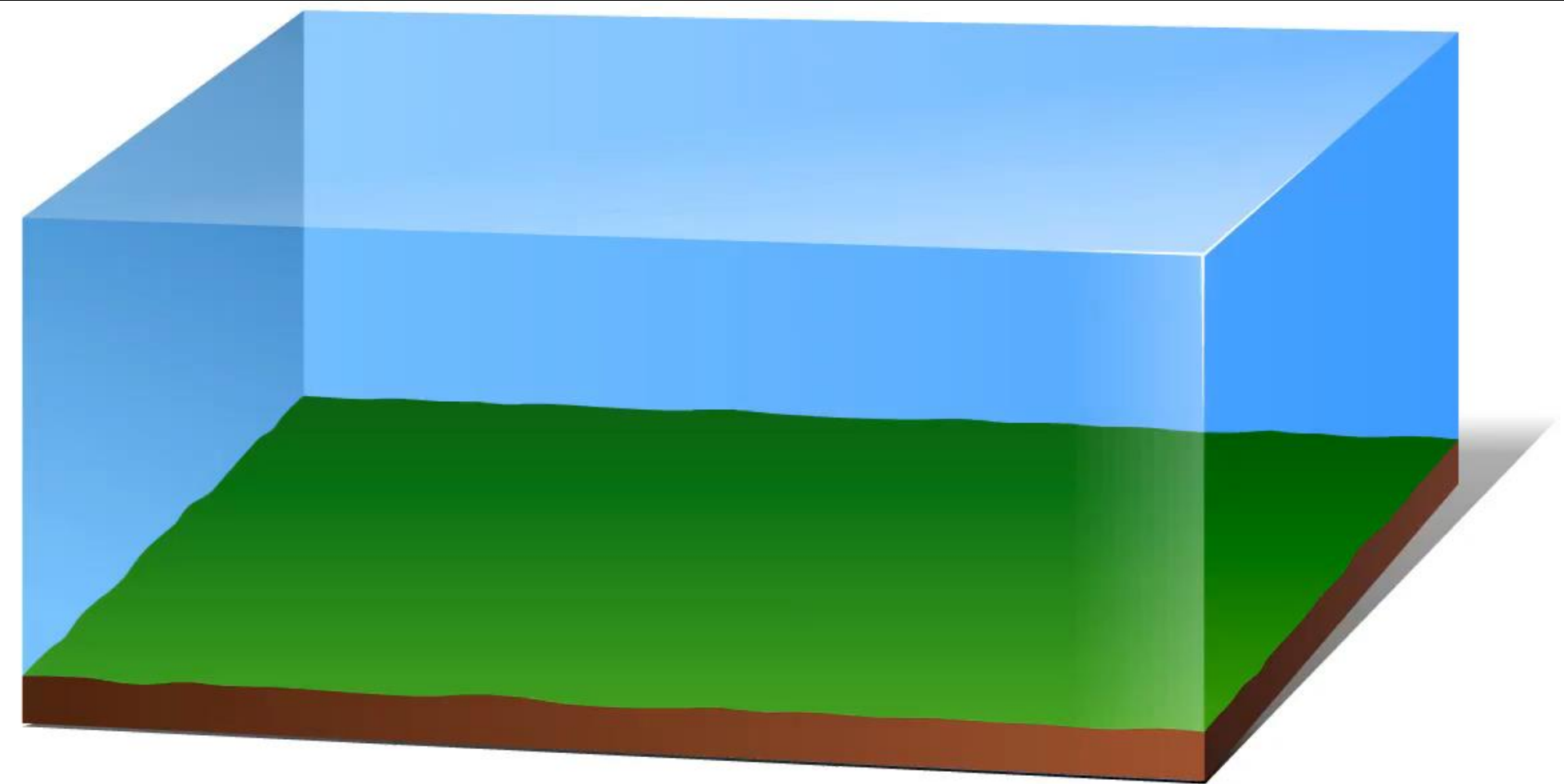
Cold Front

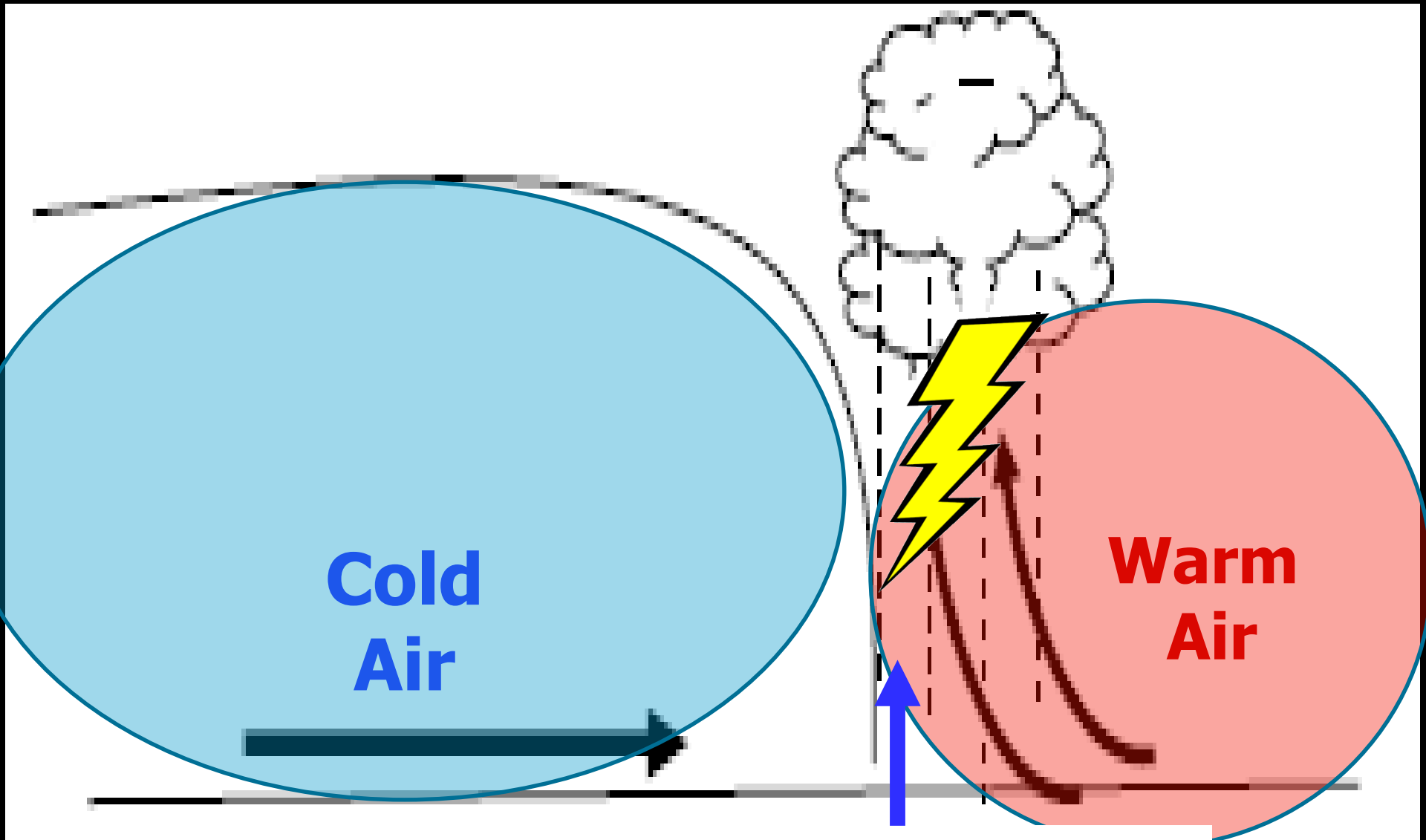
Weather Map Symbols



1. Cold air advances onto warm air QUICKLY.
2. The warm moist air is forced up because it is less dense.
3. Produces heavy precipitation (T-Storms),
4. Short-lived periods of precipitation.
5. Precipitation occurs AT the interface.
6. Brings clear skies and cooler temperatures.

Goal: Students will discover how air masses interact to form weather fronts.





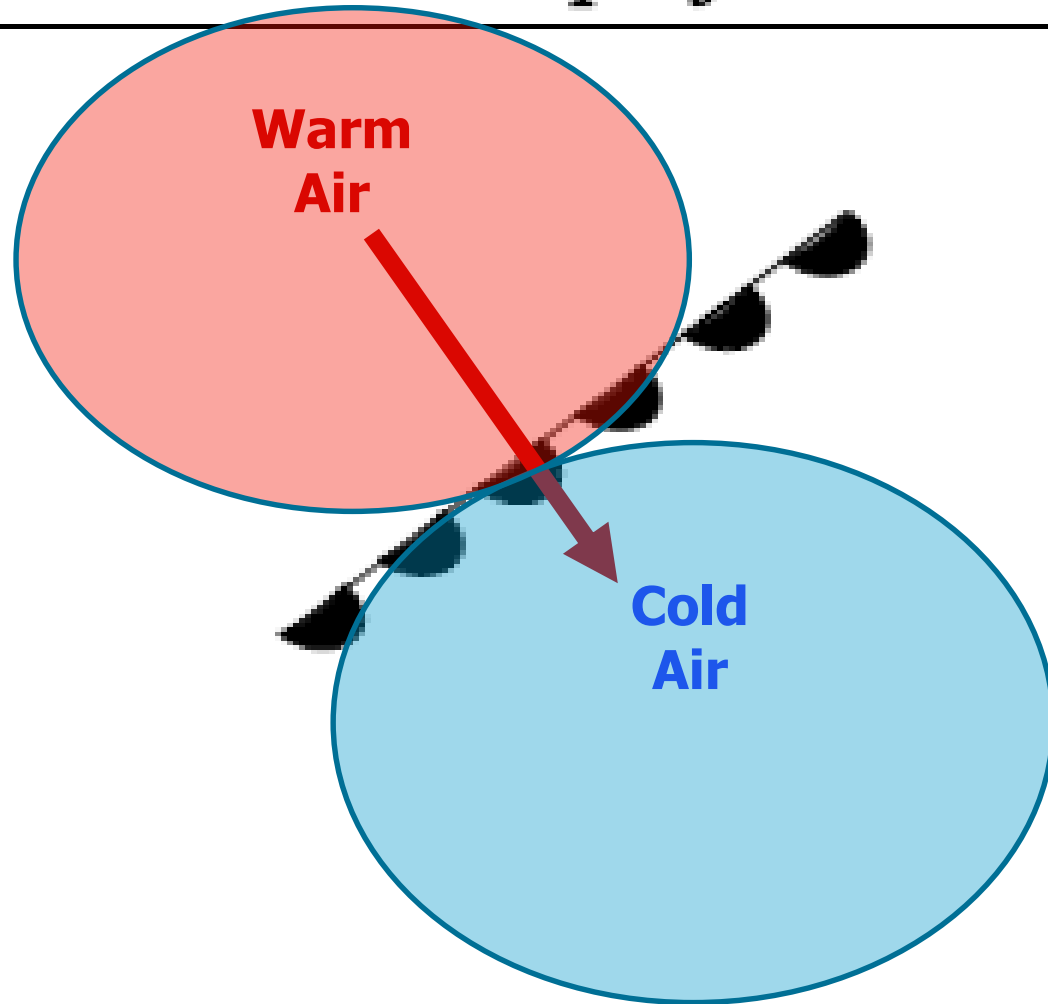
Precipitation occurs
AT frontal interface



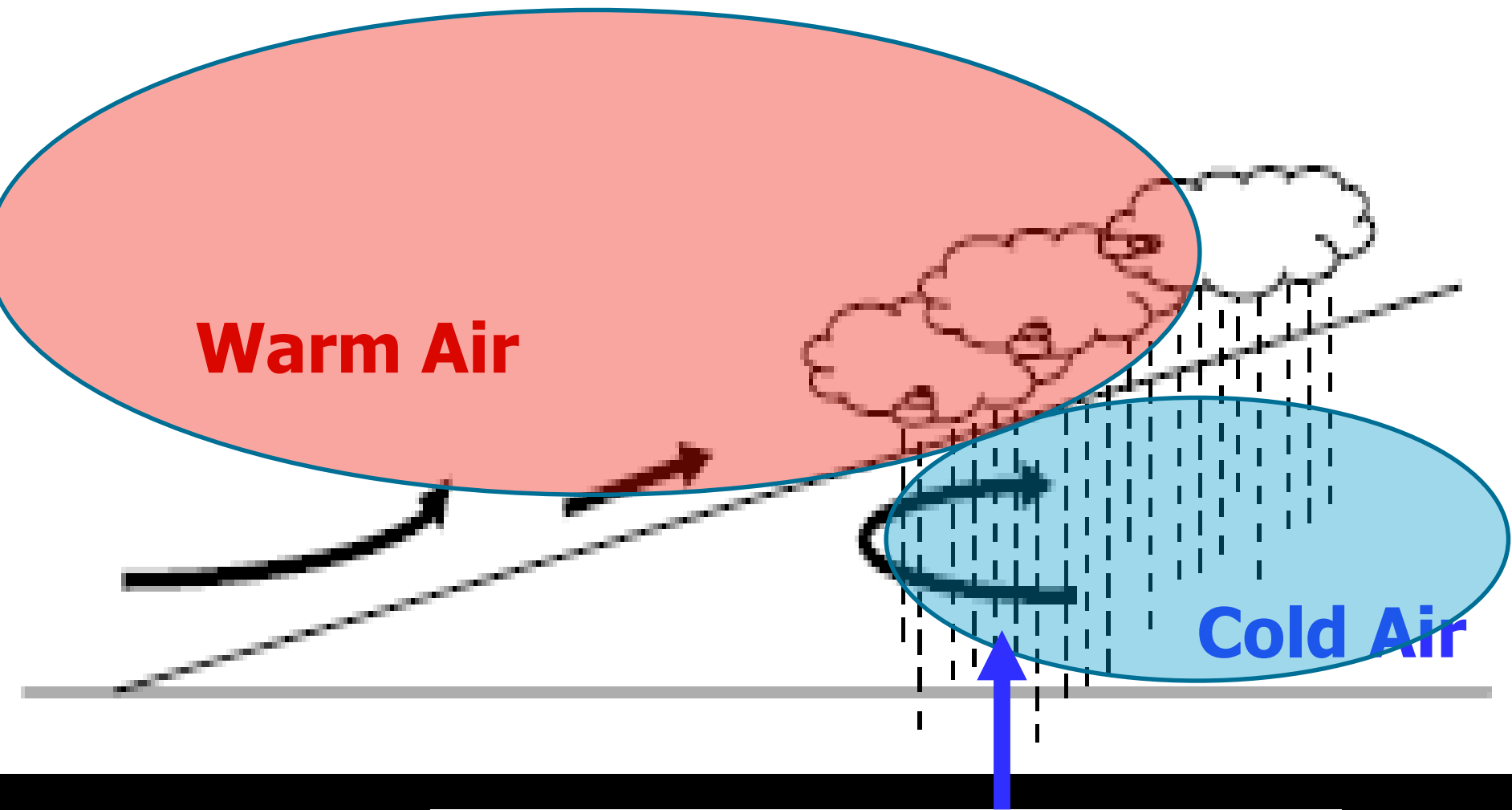
Loading

Warm Front

Weather Map Symbols

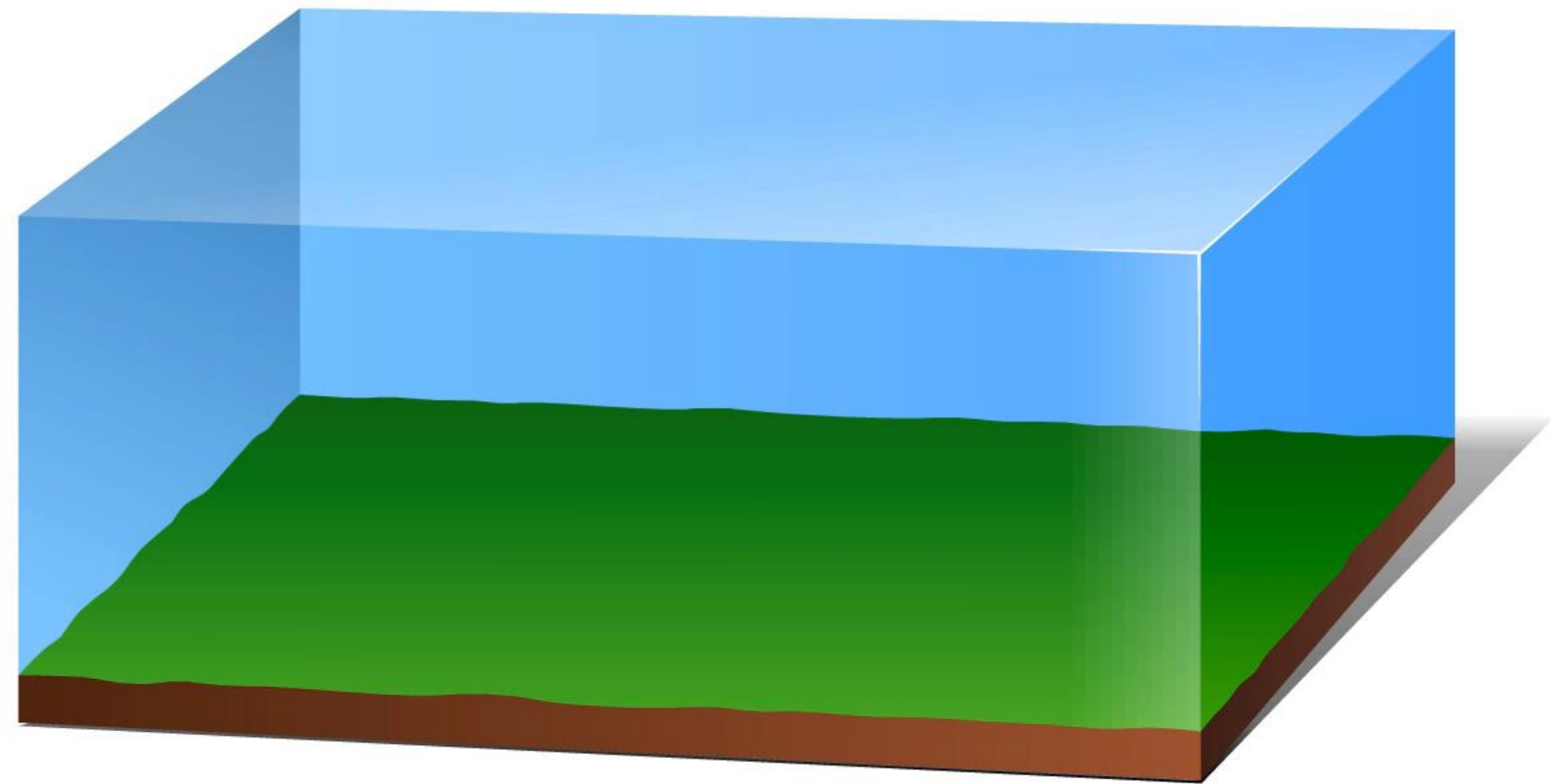


1. Warm air advances onto cold air **SLOWLY**.
2. The warm moist air gently rolls over the colder air because it **less dense**.
3. Produces **long steady precipitation** (for hours).
4. Precipitation occurs **AHEAD OF** the interface.
5. Brings **warmer** temperatures with **overcast** skies.



Precipitation occurs AHEAD
frontal interface

Goal: Students will discover how air masses interact to form weather fronts.





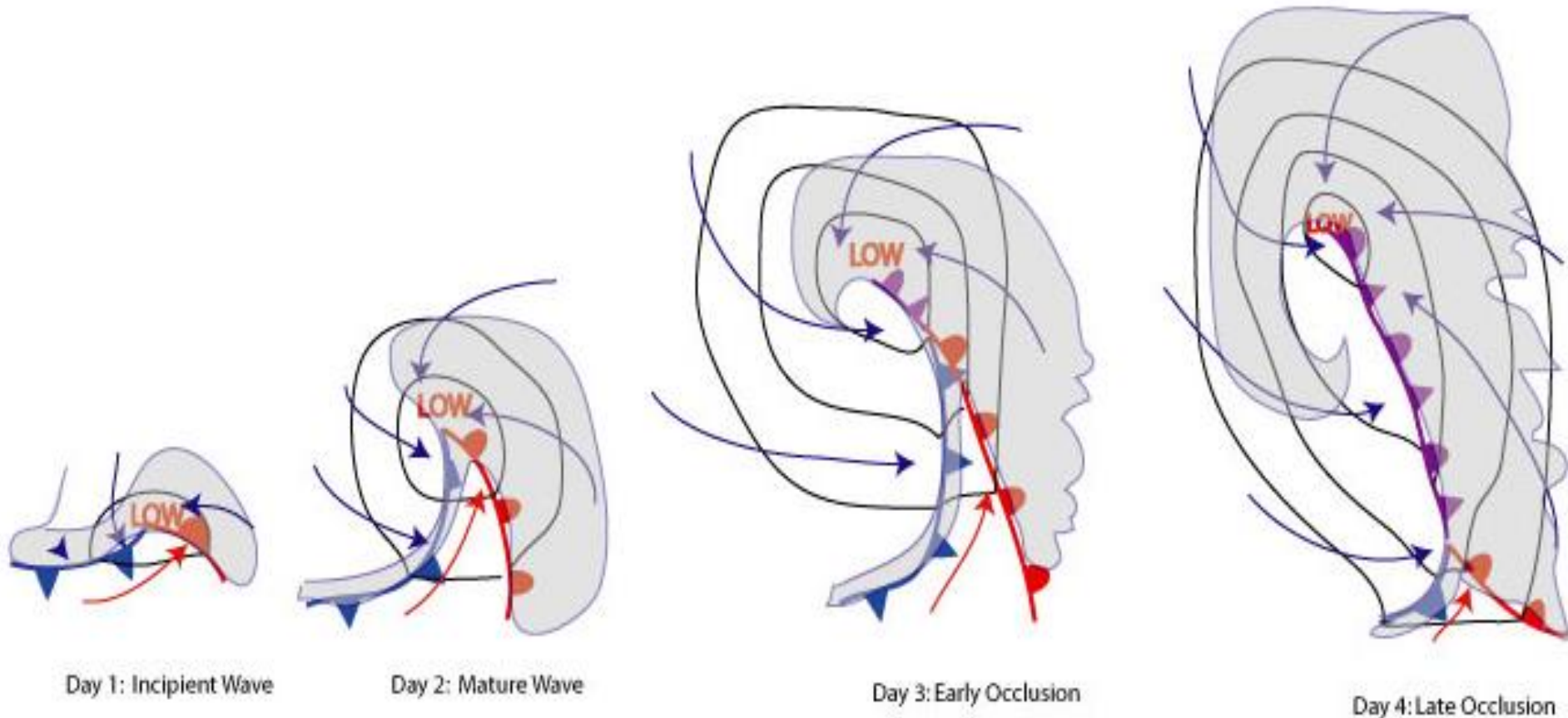
0 %

Loading

Occluded Front

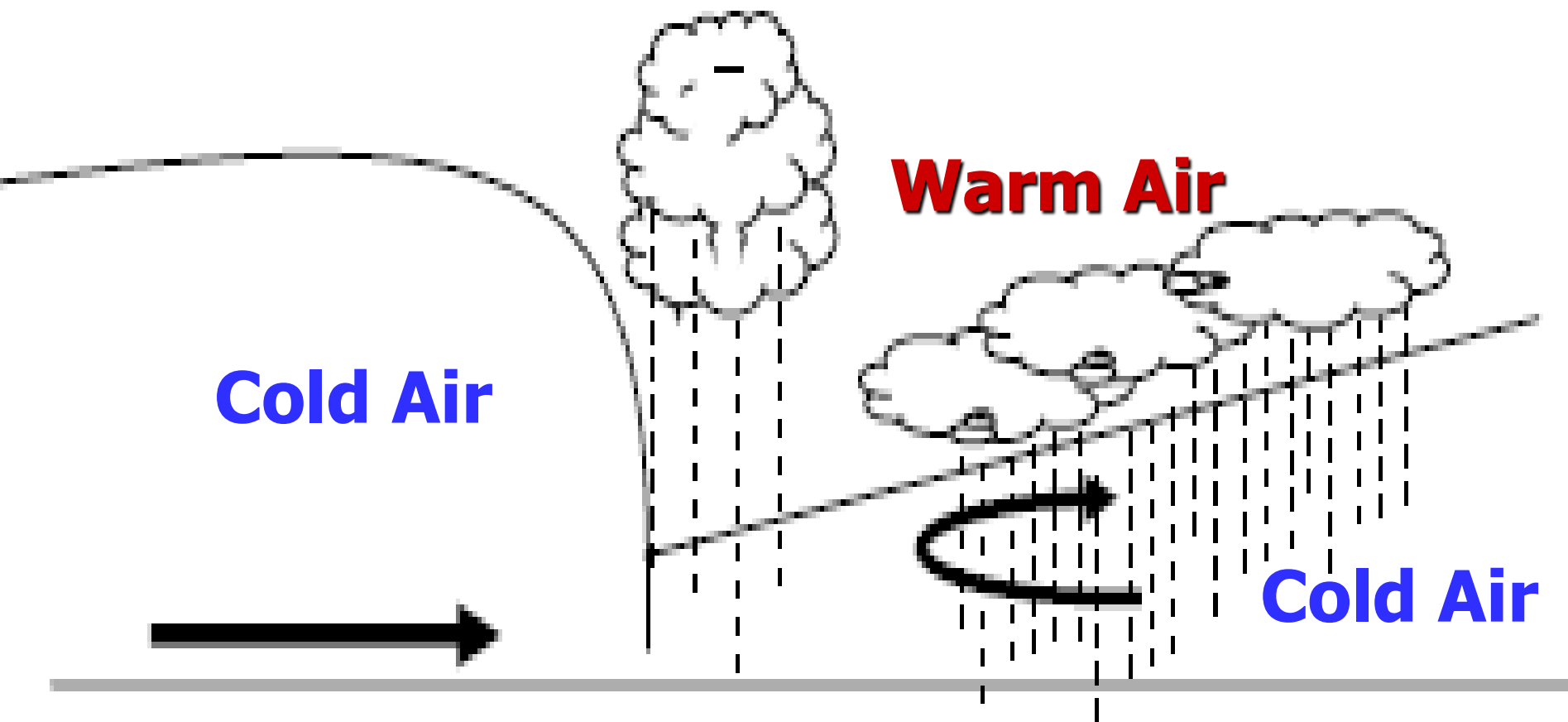
1. COLD FRONT advancing onto a WARM FRONT.
2. Cold front over takes the warm front because it moves faster.
3. Warm Air is forced upward because it is less dense.

4. When the Cold Front takes over it ZIPS together to form OCCLUDED FRONT.

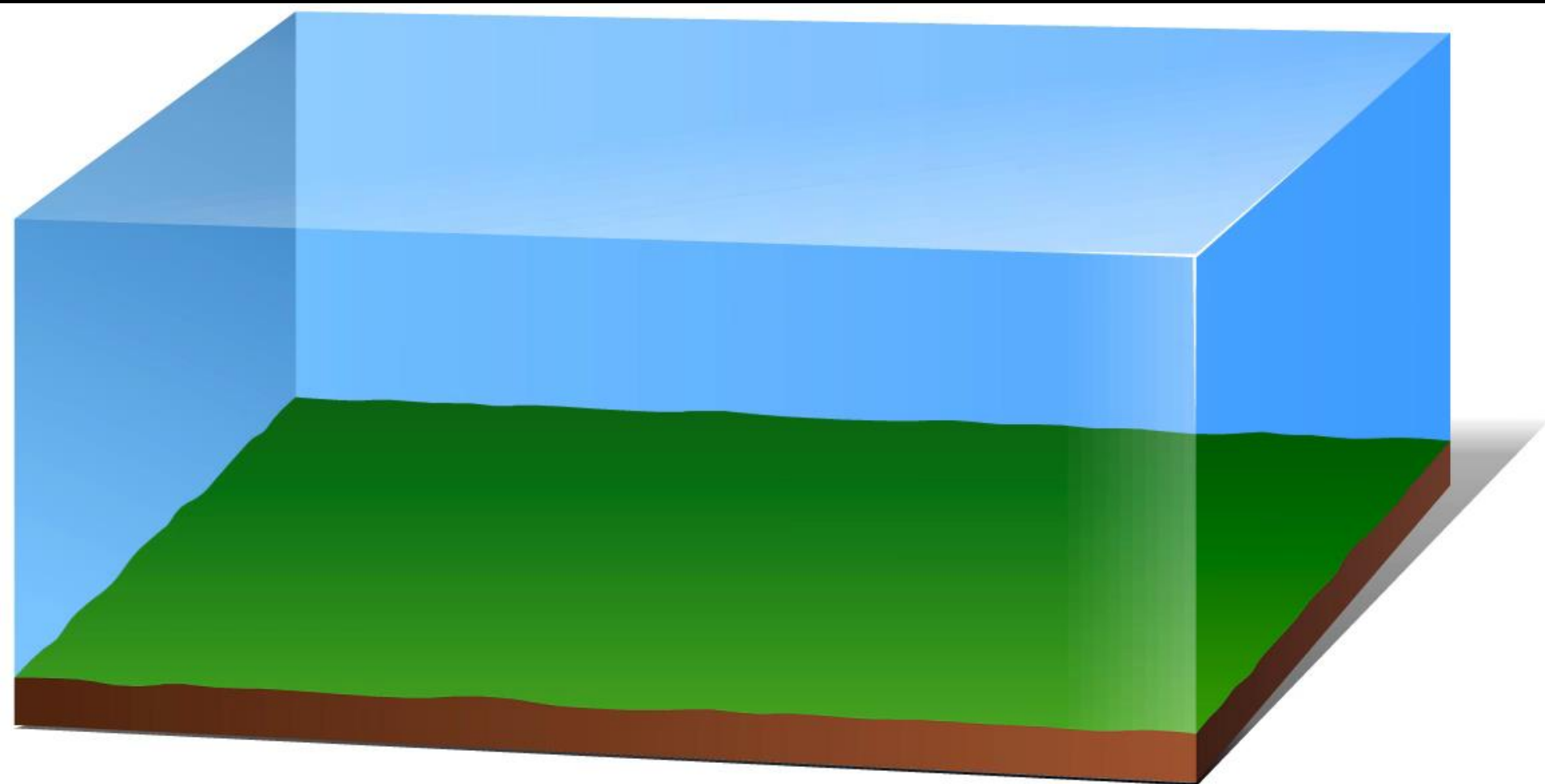


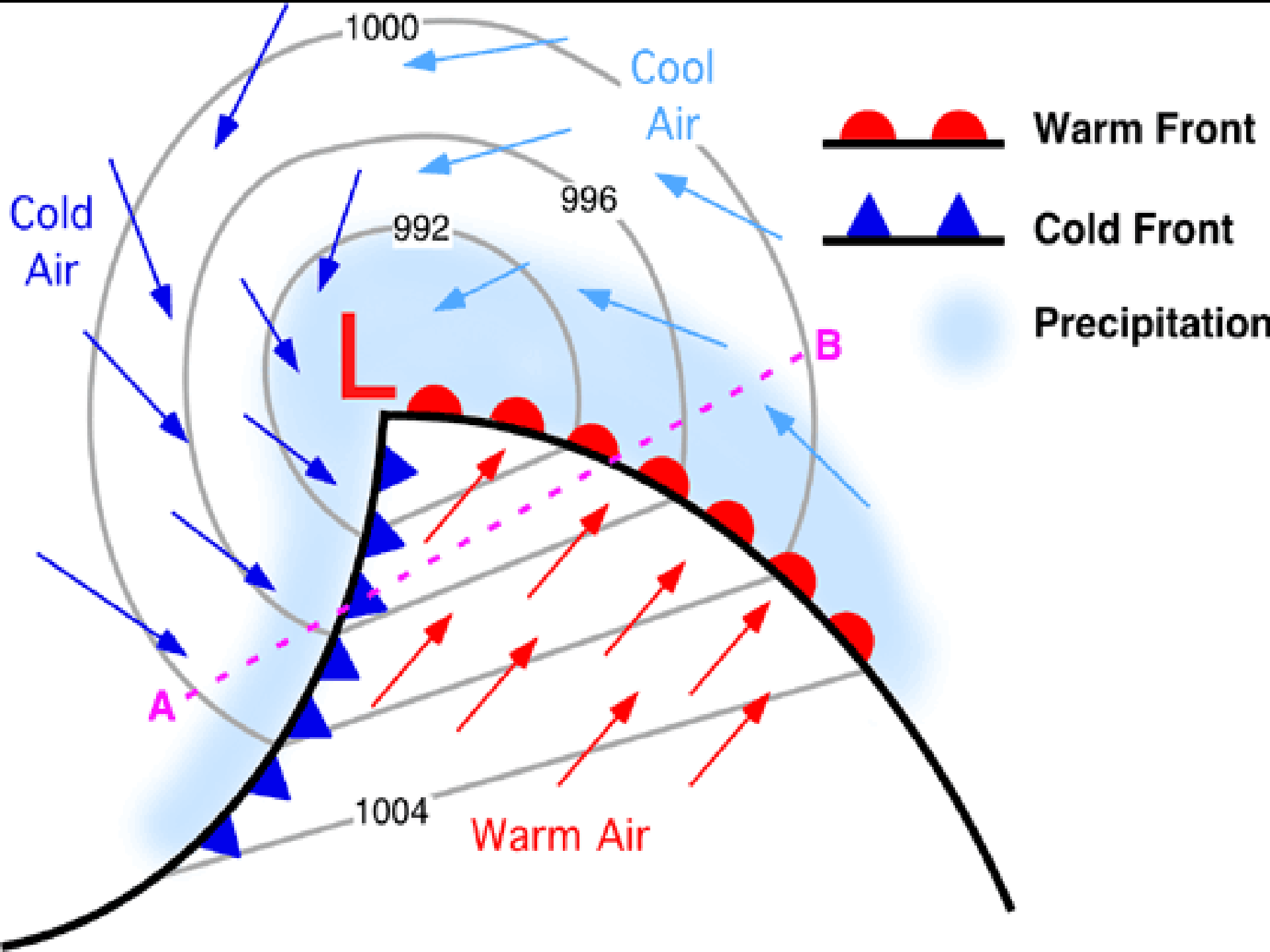
Stages in the Life Cycle of a Wave Cyclone

Grey Shading Indicates Cloudiness



Goal: Students will discover how air masses interact to form weather fronts.



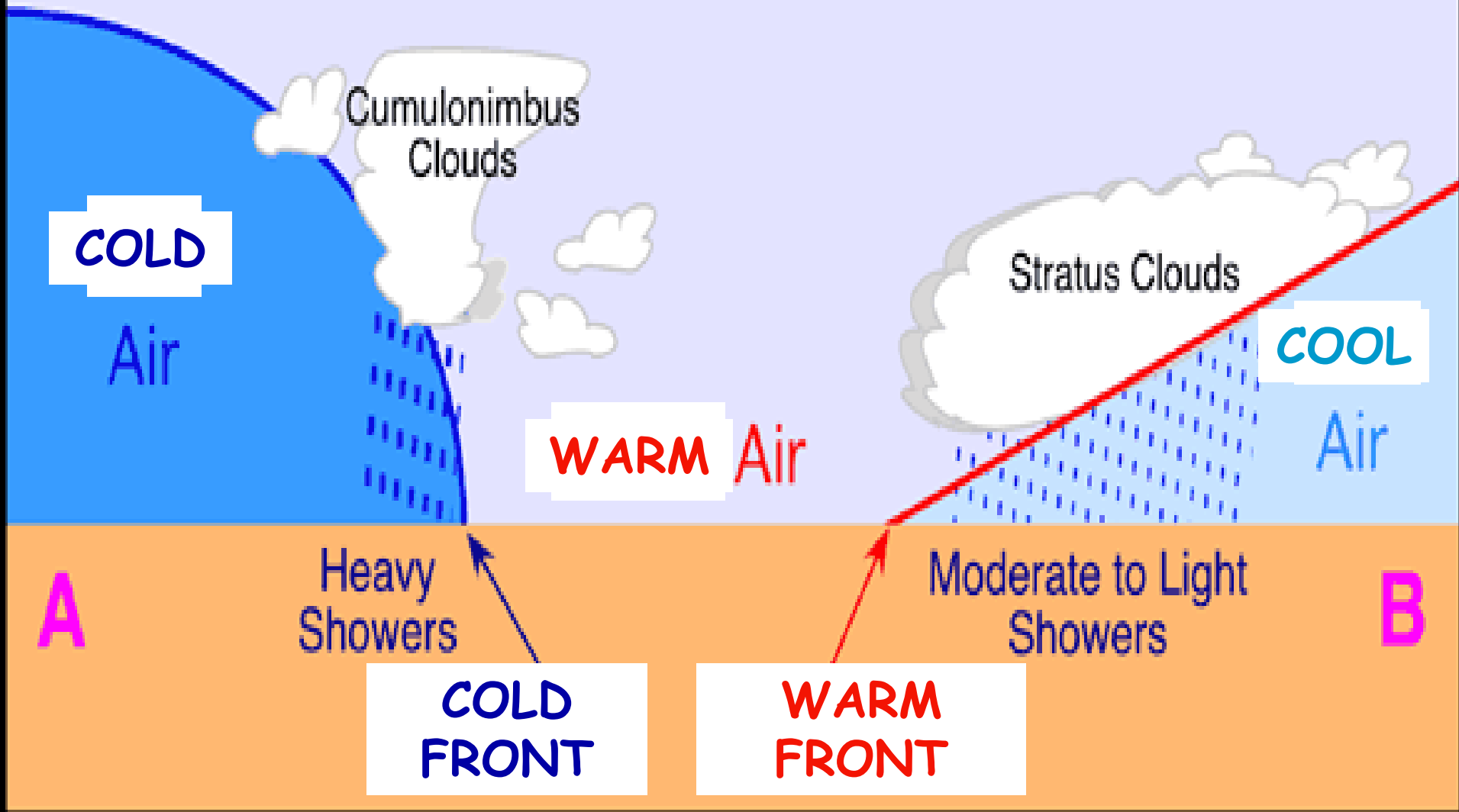




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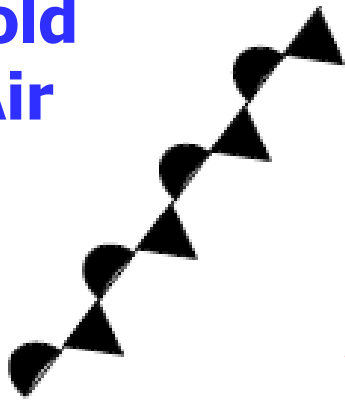
Direction of Storm Movement →



Stationary Front

Weather Map Symbols

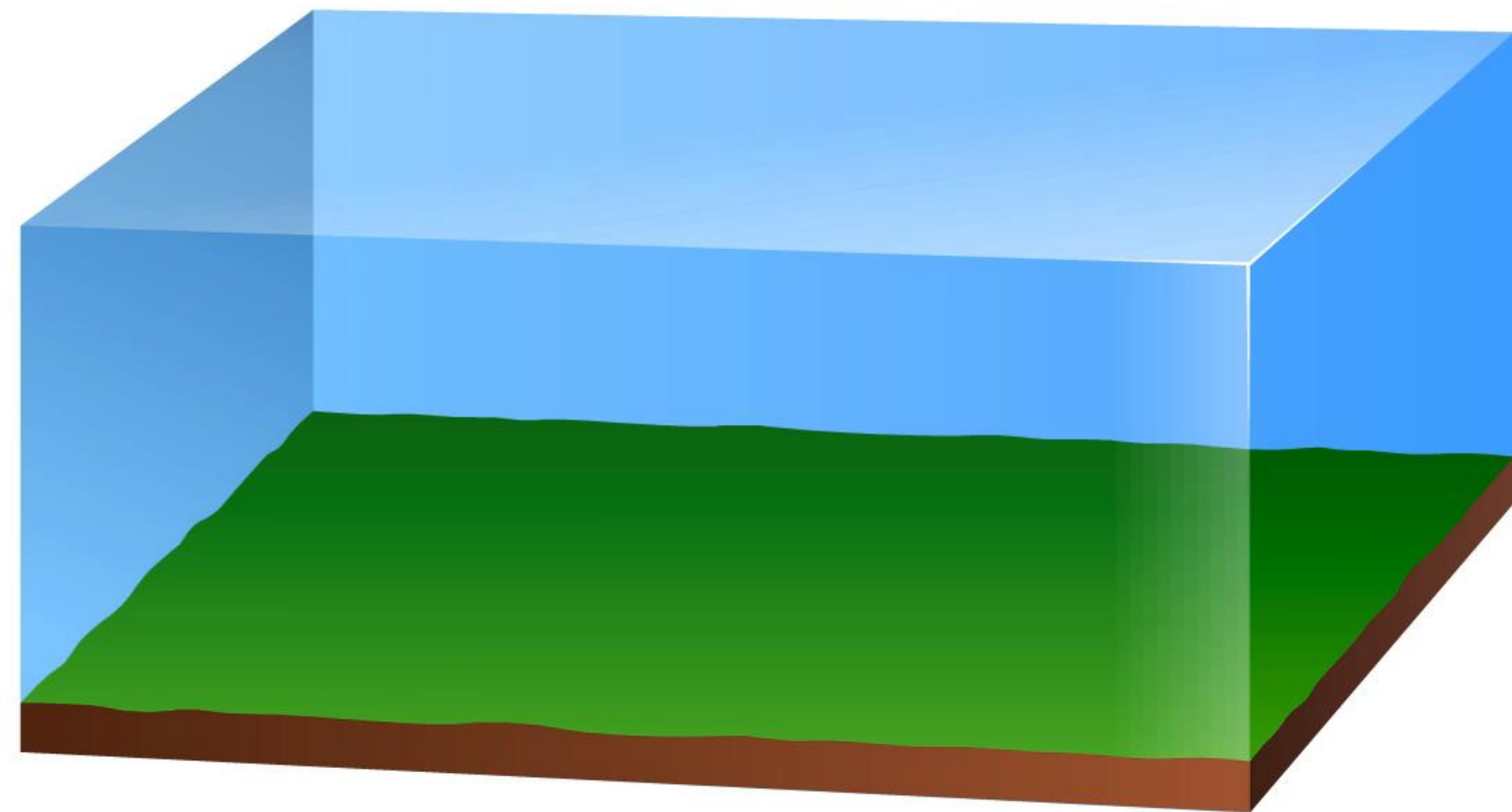
**Cold
Air**



**Warm
Air**

1. Stationary means the front is not moving.
2. Movement is difficult to predict
3. Winds are blowing in opposite directions on each side of the front.
4. Clouds can last for days.

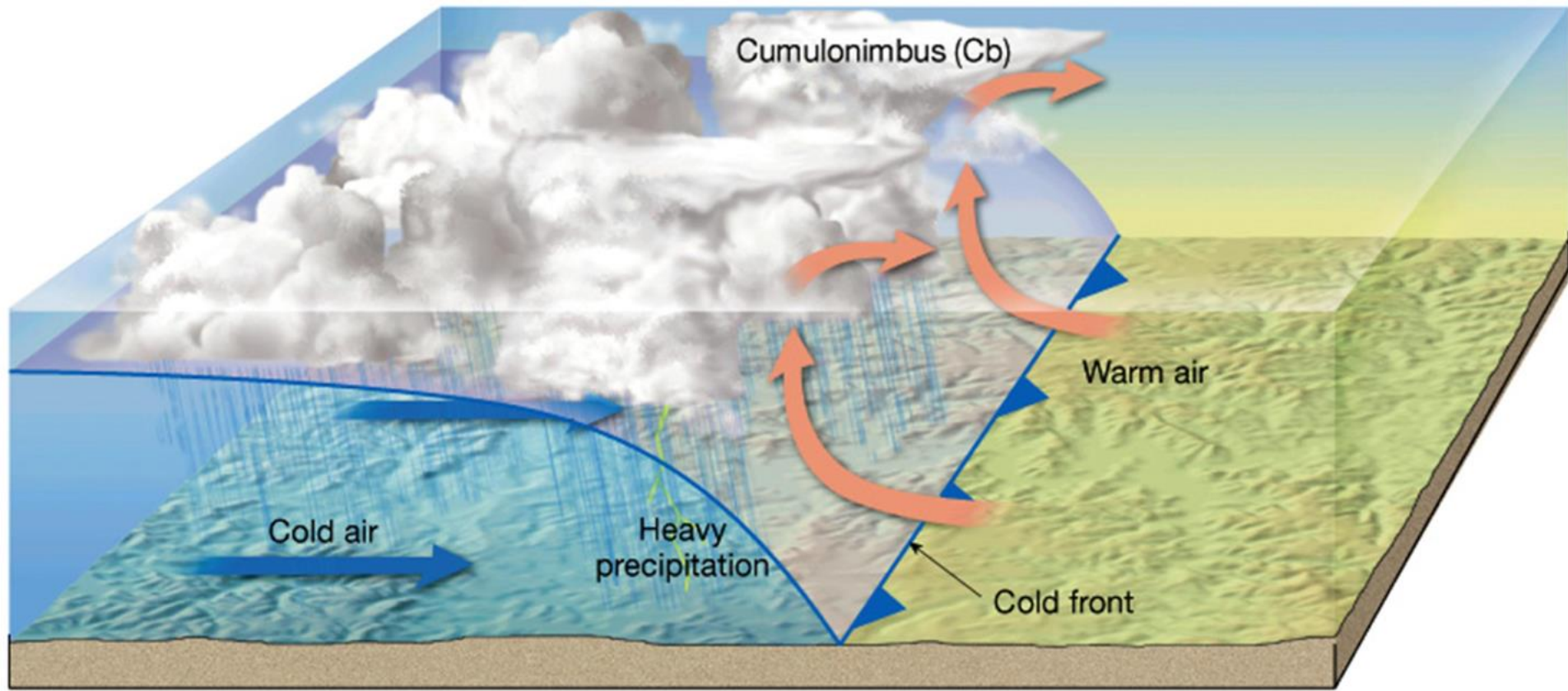
Goal: Students will discover how air masses interact to form weather fronts.



Goal: Students will discover how air masses interact to form weather fronts.

Cold front

Source: Lutgens and Tarbuck, 2004



Goal: Students will discover how air masses interact to form weather fronts.

Warm front

Source: Lutgens and Tarbuck, 2004

