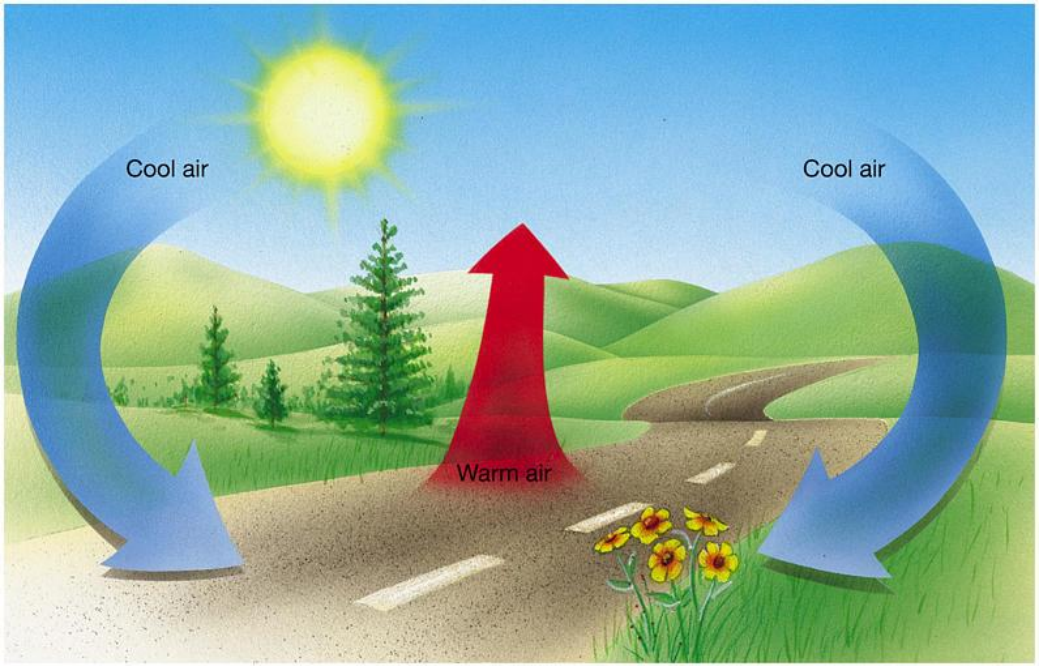
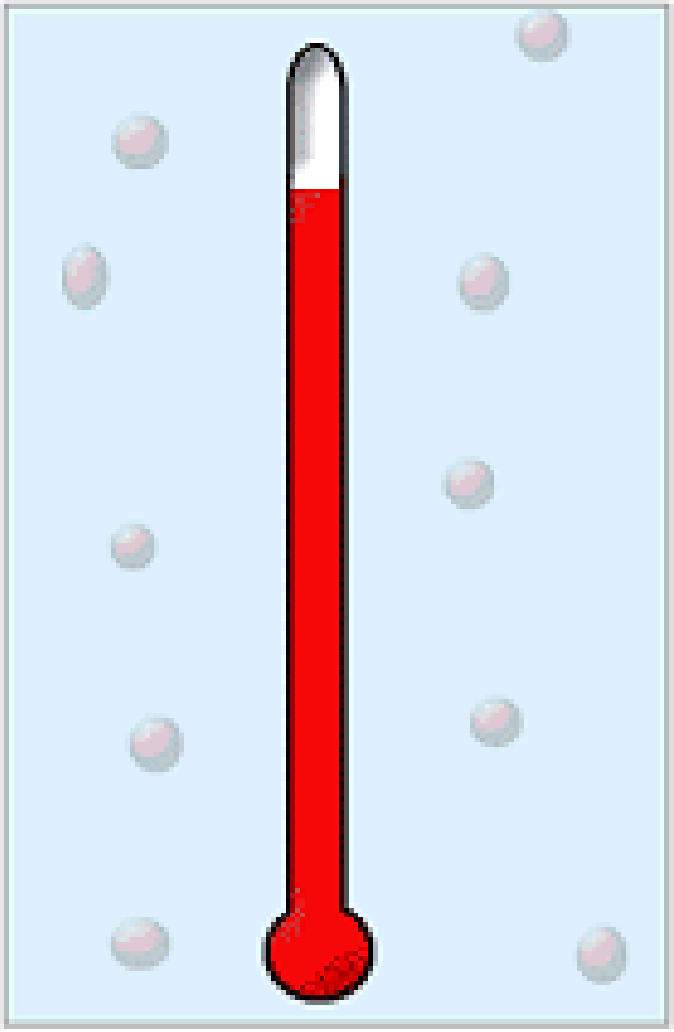
Winds, Currents, Weather and Fronts

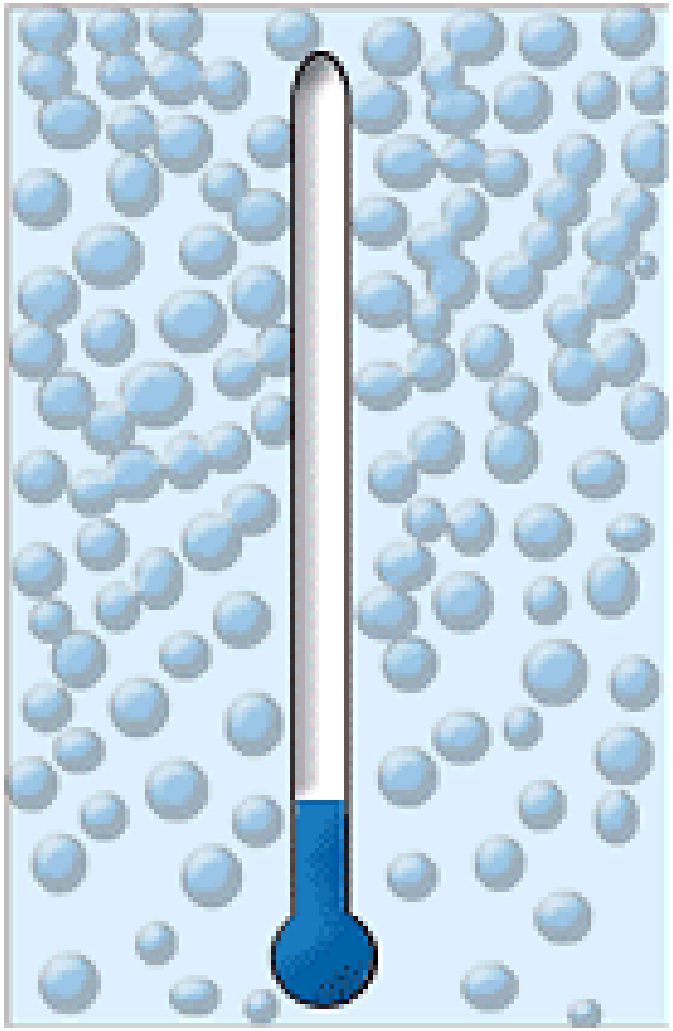
CONVECTION

transfer of heat by the <u>movement</u> of warmed matter

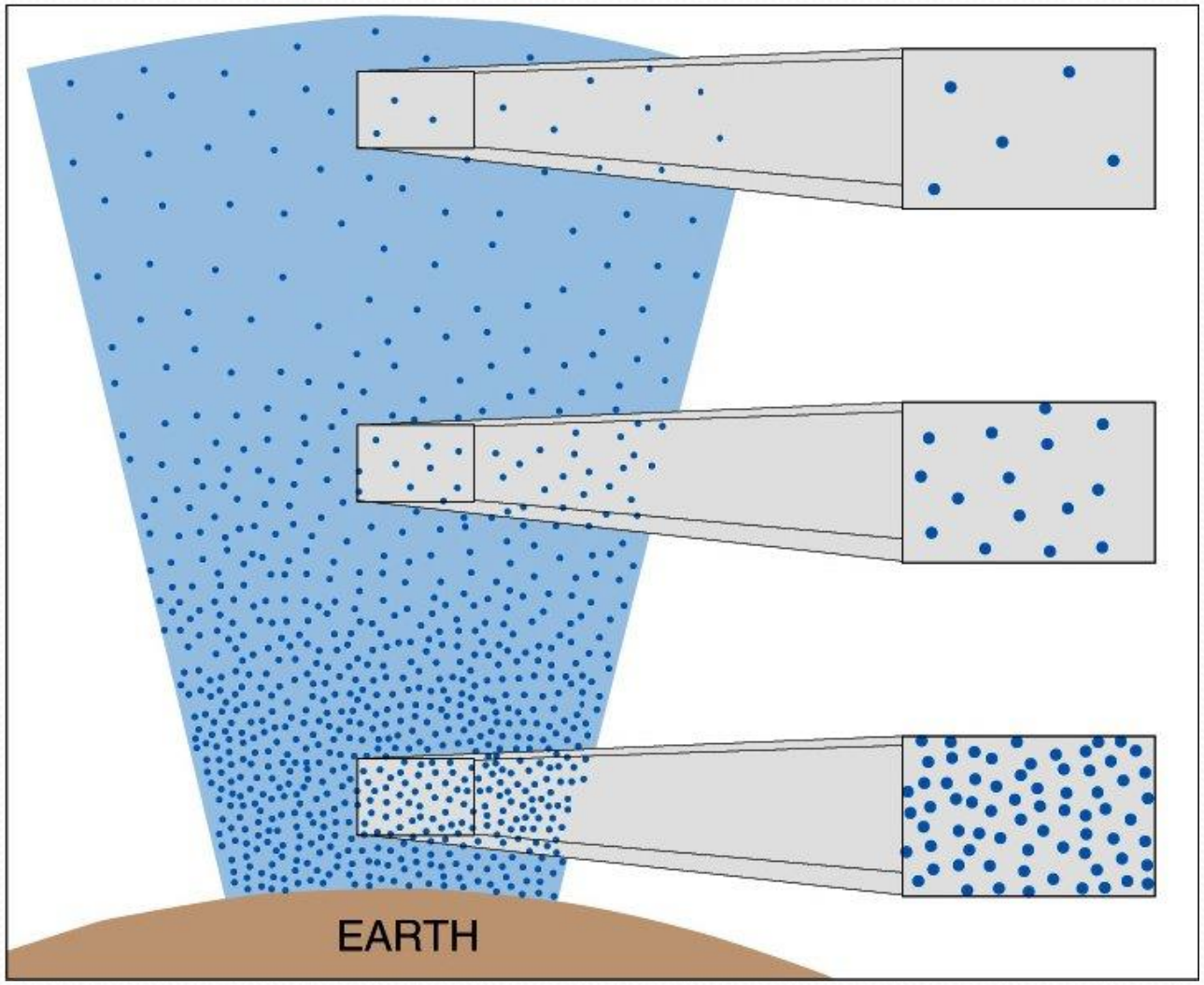


Hot Air is Less Dense!





Atmospheric Density



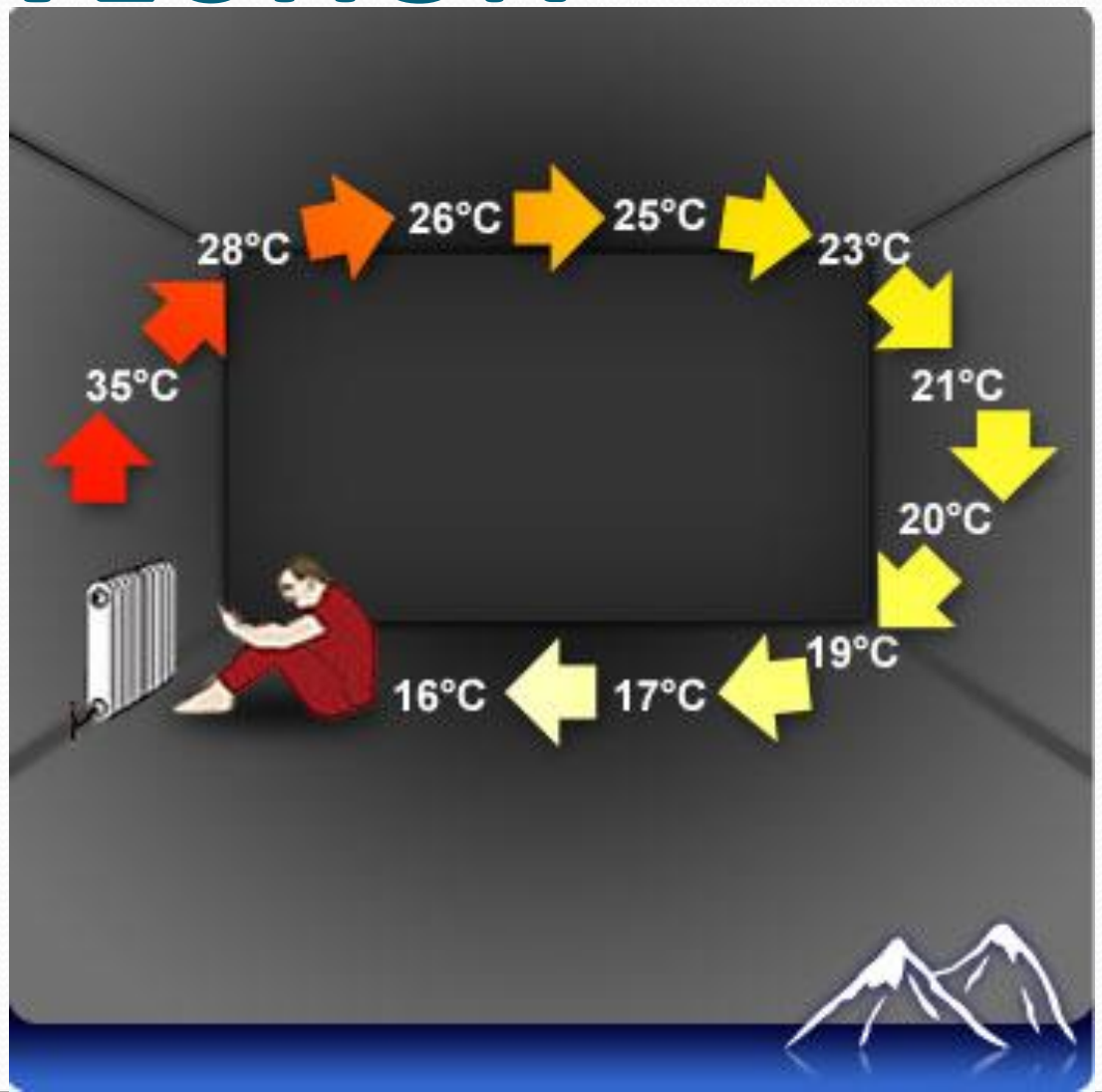
What is most dense SINKS!

Cold air sinks.

Warm air rises.

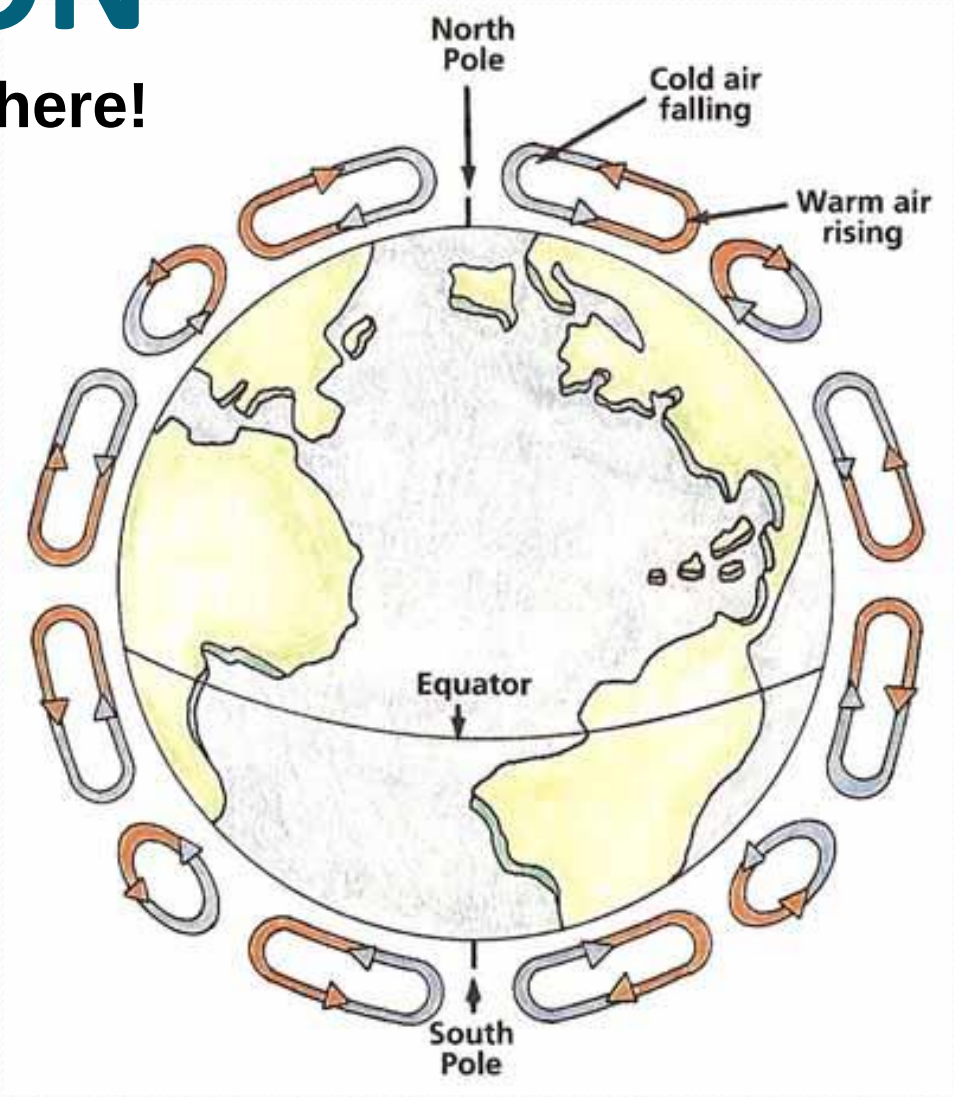
What Can Convection Do?

CONVECTION



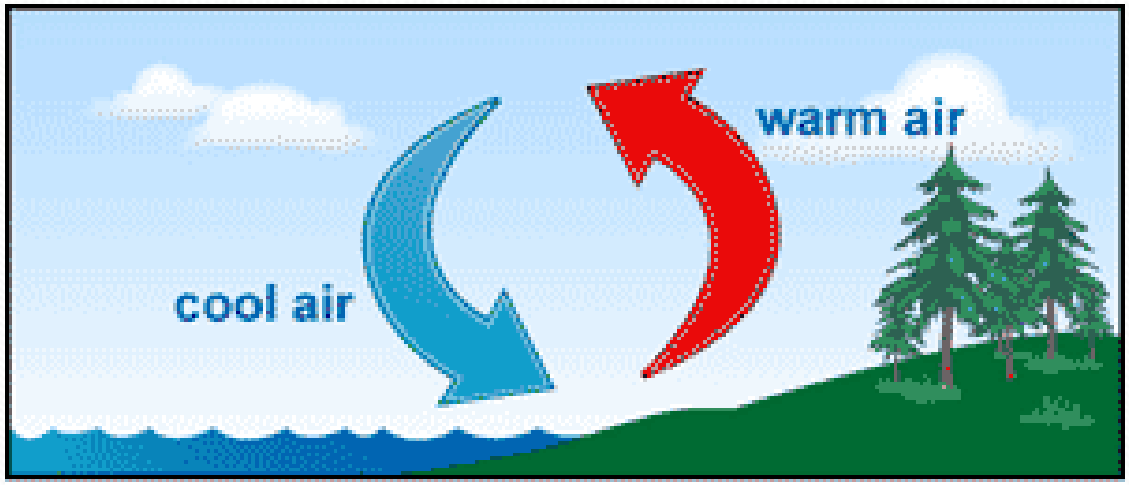
CONVECTION

Moves air in the atmosphere!

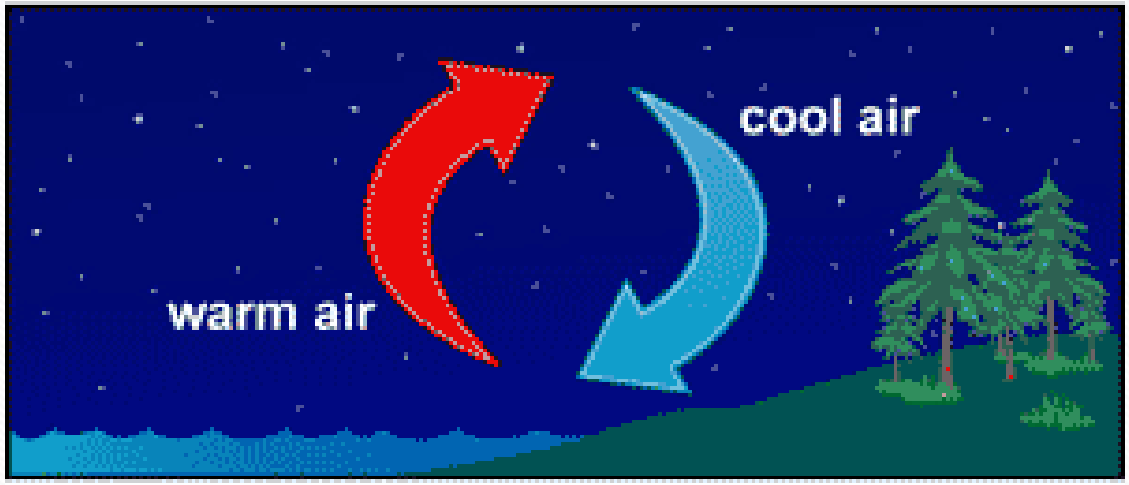


CONVECTION

Wind over the shore changes direction because of EARTH'S UNEVEN WARMING & COOLING!

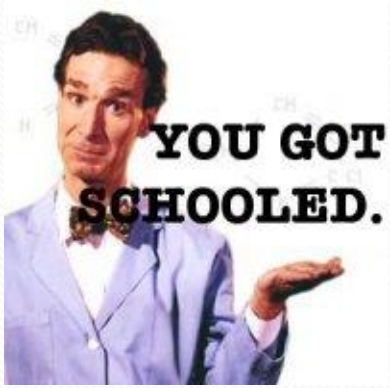


DAY TIME



NIGHT TIME

What Causes Wind?



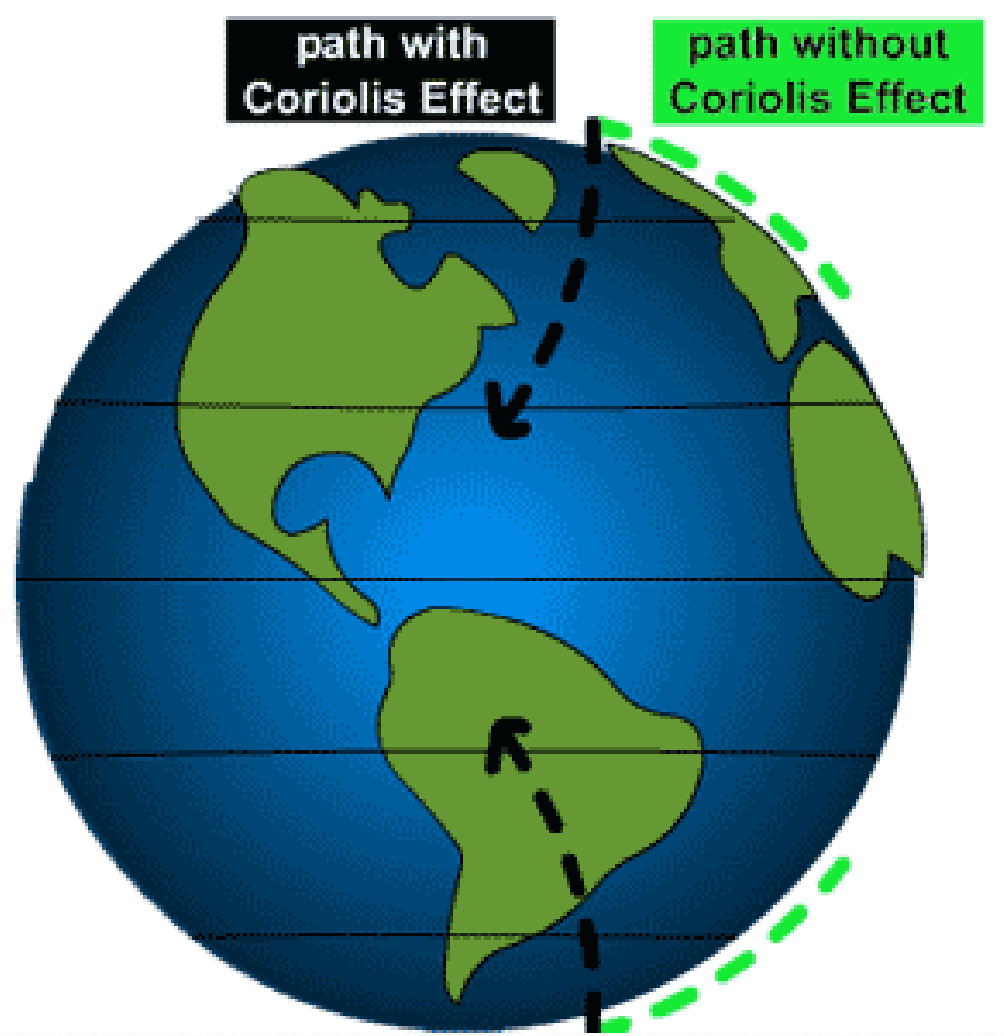
Bill Nye's Explains Wind in 2 minutes!

http://www.youtube.com/watch?v=uBqohRu2RRk&feature=related

How did he demonstrate **convection**?

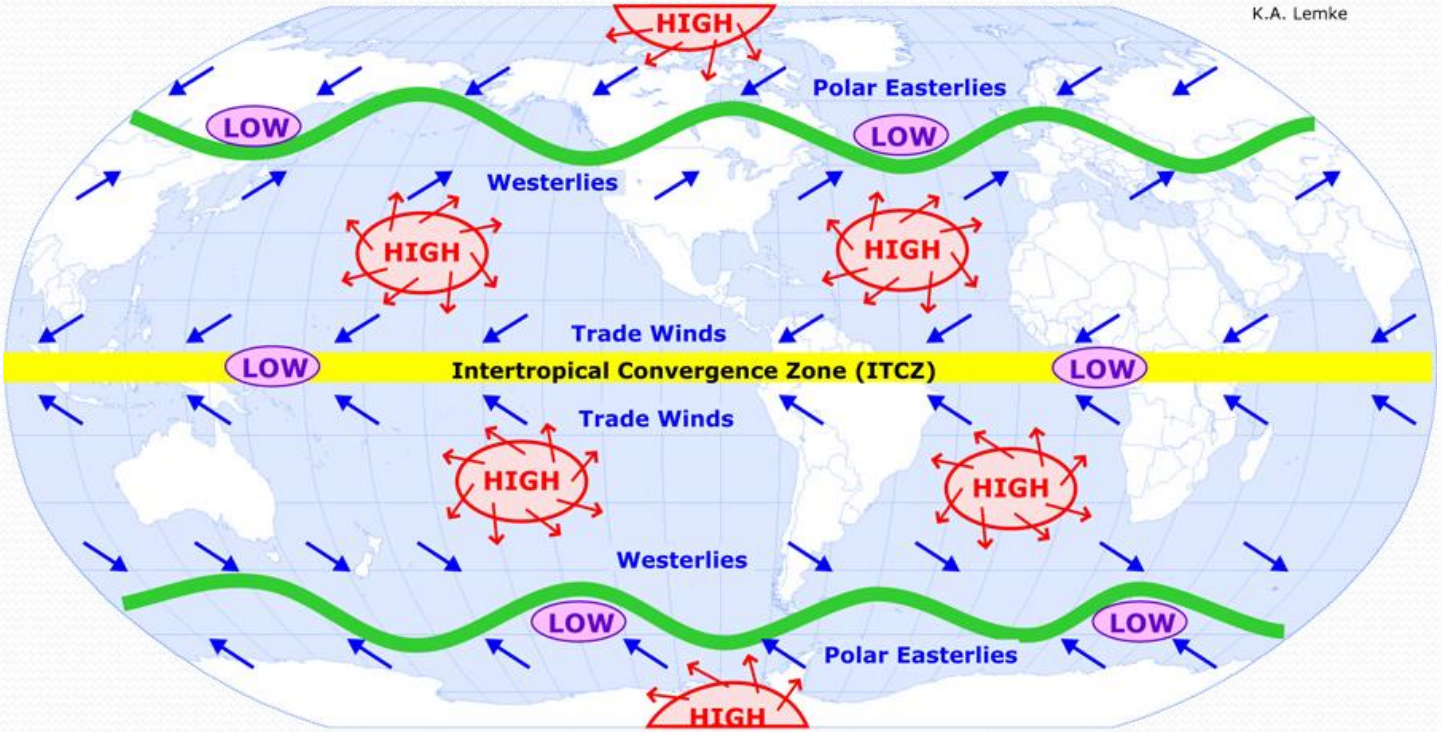
Coriolis Effect

- YouTube: Coriolis Effect



Coriolis Effect

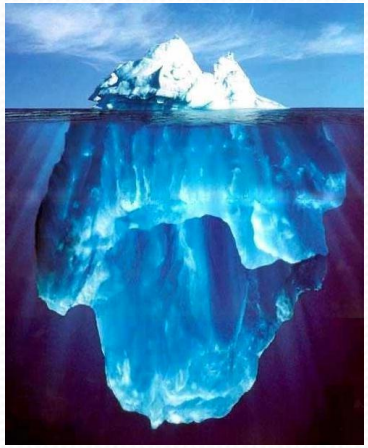
The rotation of the Earth causes wind and ocean currents to move to the right in the northern hemisphere and to the left in the southern hemisphere.



What About Convection in Water?

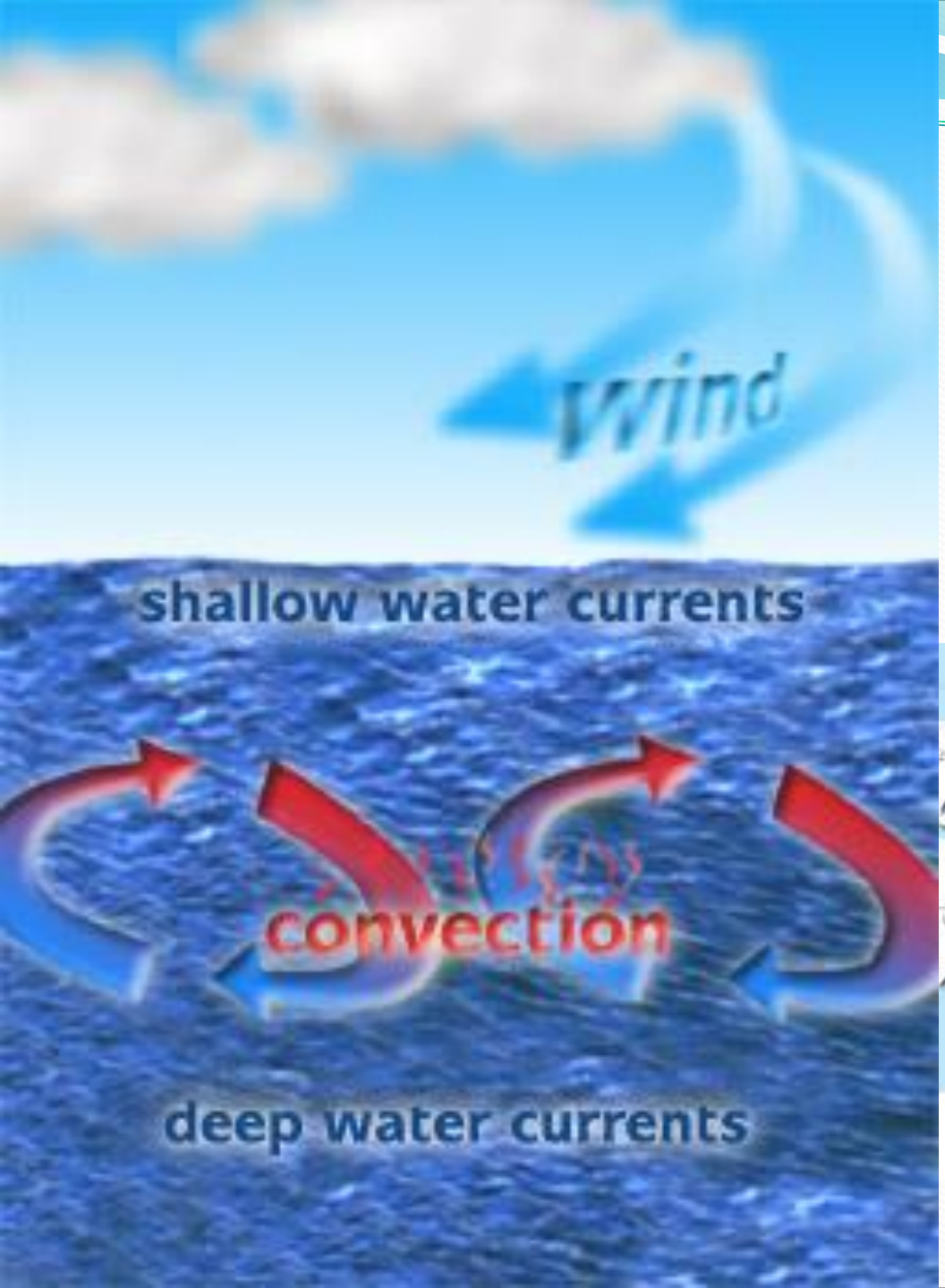
- Water and air are both fluids.
- They both move due to convection!
- Just like air, when liquid water is heated, it expands, becomes less dense, and rises.

Side note: Water is different, however, because of it's unique structure as a solid. Ice is actually less dense than liquid water whereas other substances are most dense as solids!



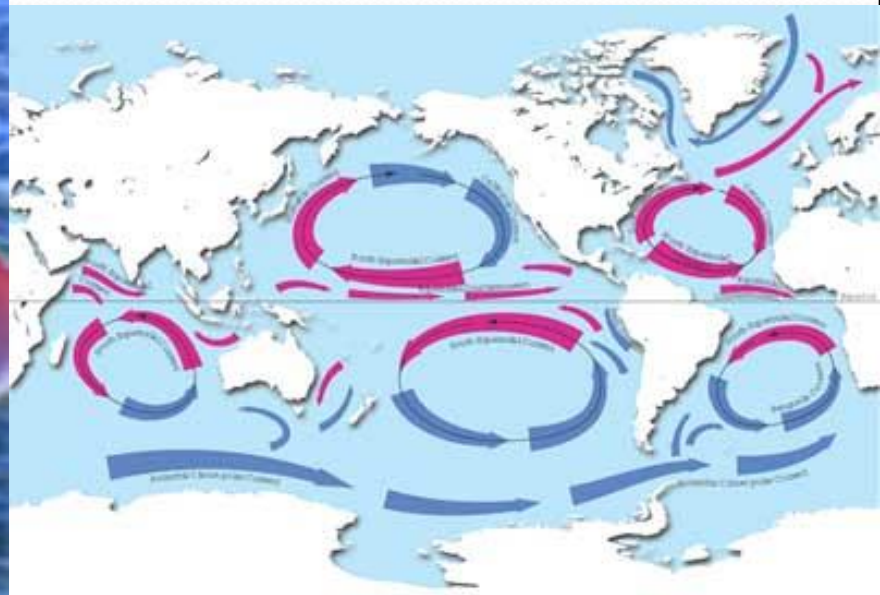
CONVECTION IN LIQUIDS!

Soup is heated in the pan by convection. The hot soup rises. Cool soup falls to take the hot soup's place.

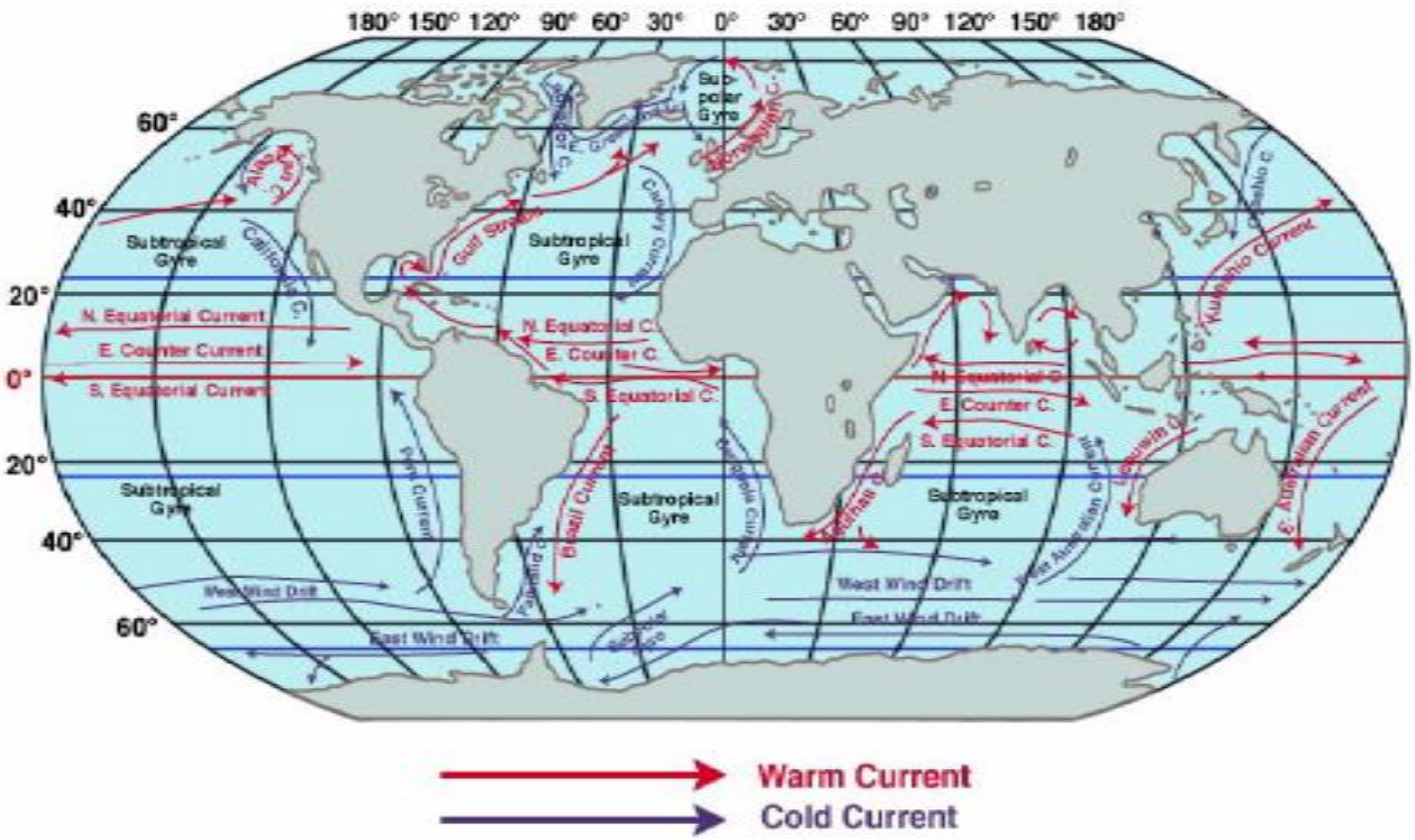


CONVECTION

causes deep ocean currents!

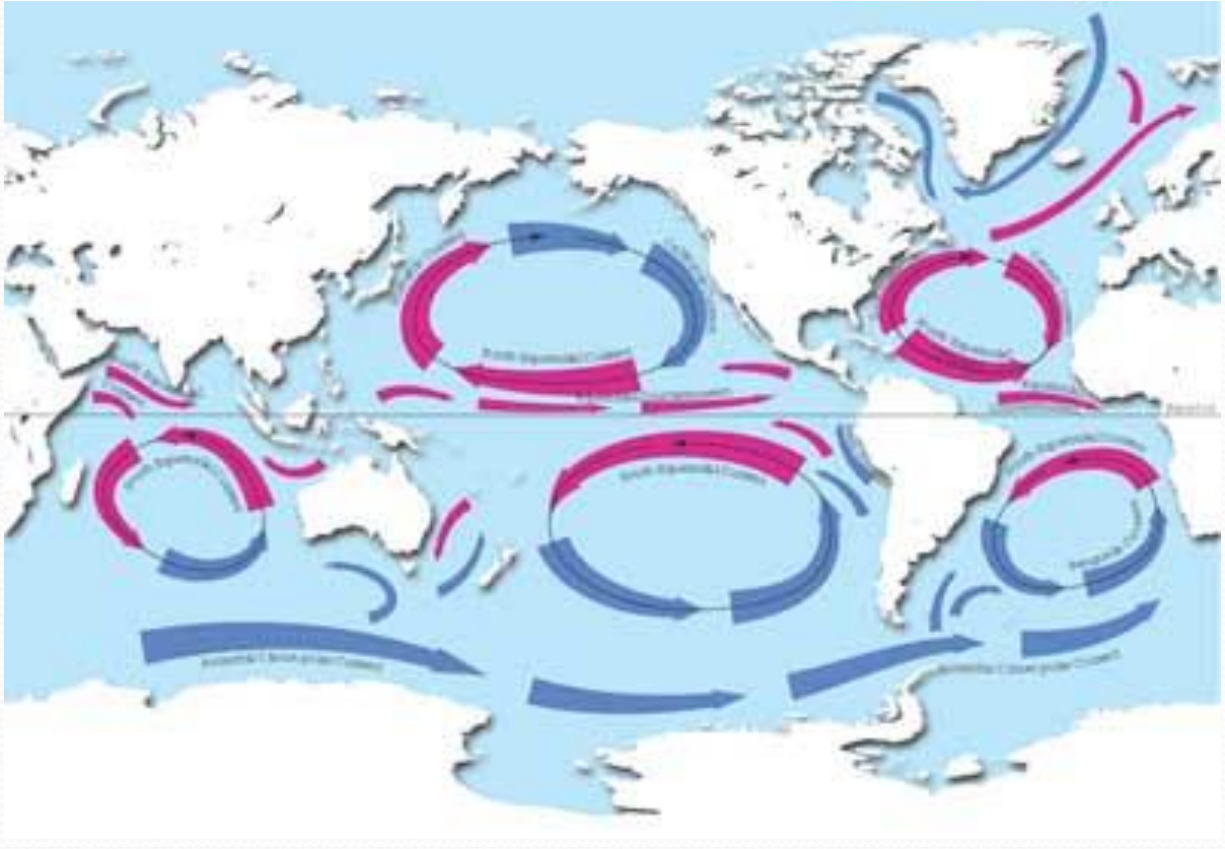


Ocean Currents and Coastal Temperatures



Ocean Currents

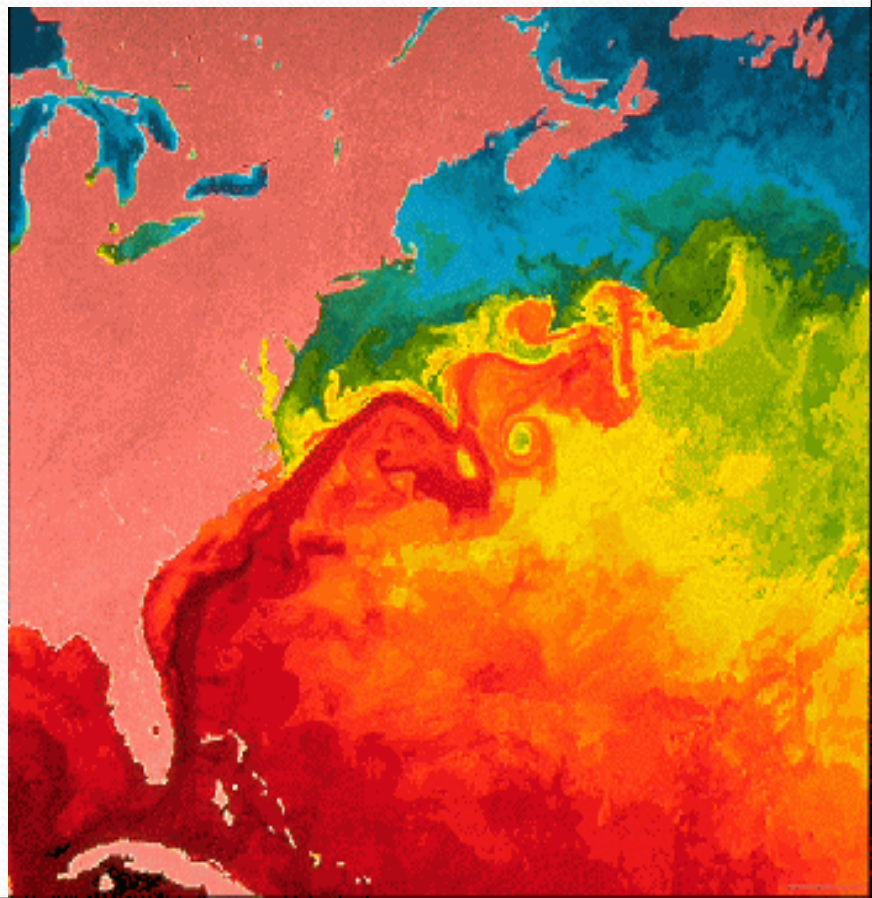
- Ocean currents circulate warm and cool water.
- Warm currents come from the equator and warm the land it travels by
- Cold currents come from the poles and cool the land it travels by



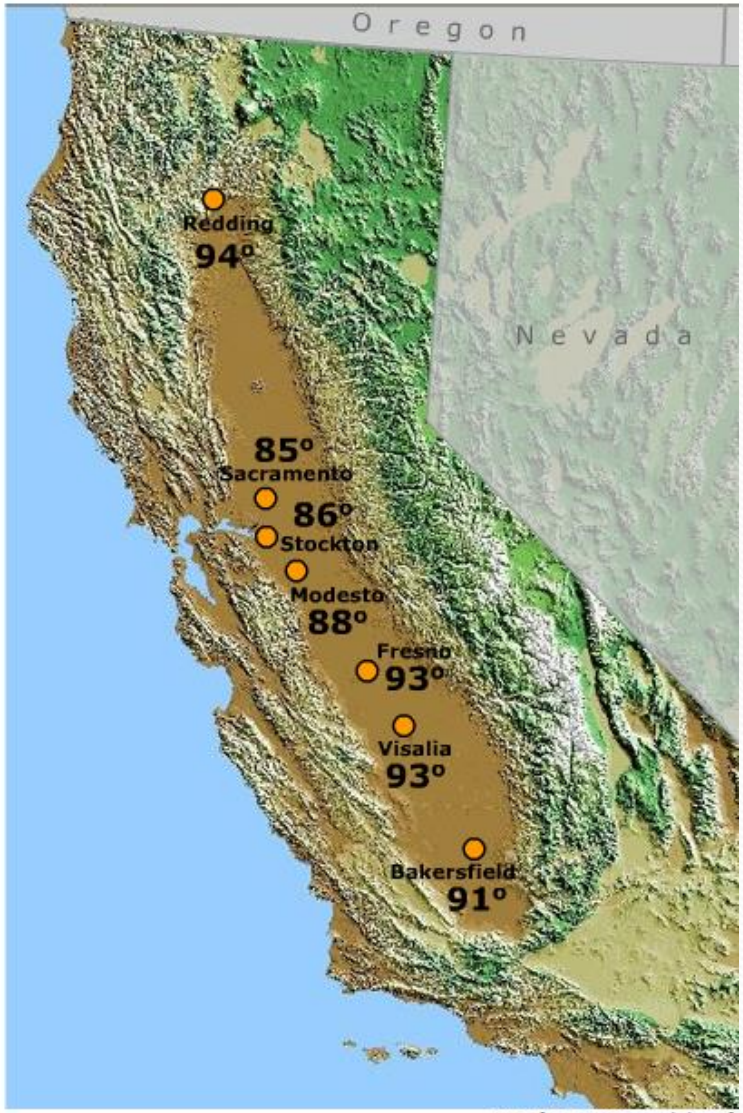
Ocean Currents

What is the name of this current?

It carries warm water from the Gulf of Mexico!

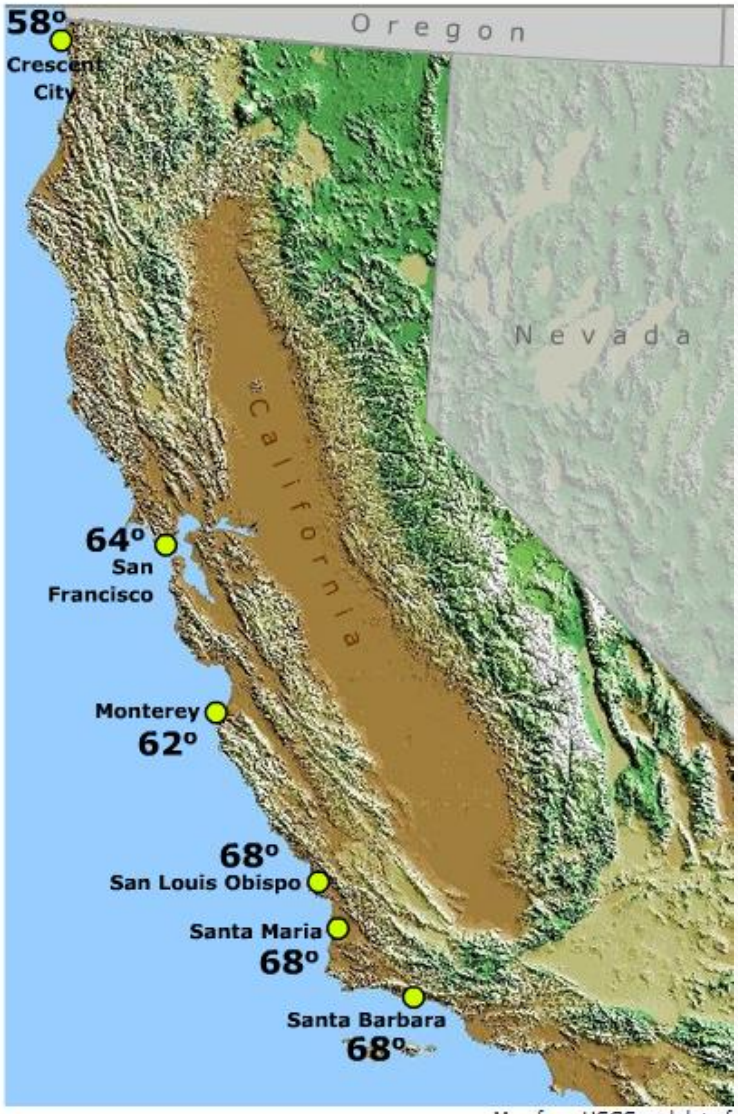


Inland vs. Coastal Cities



Map from USGS and data fr

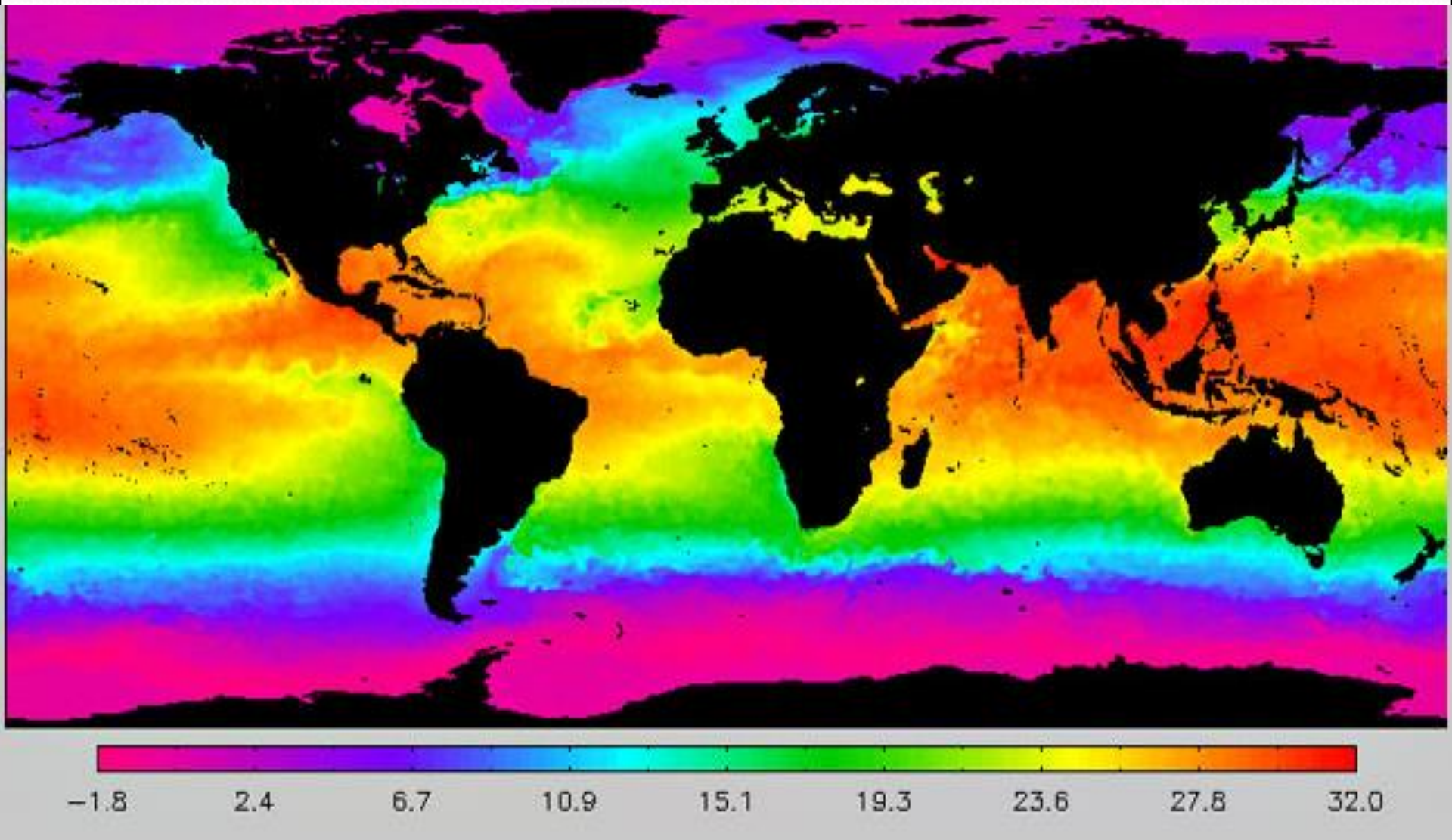
Temperatures at 5:00 p.m. Pacific Time on August 13, 2001.



Map from USGS and data fr

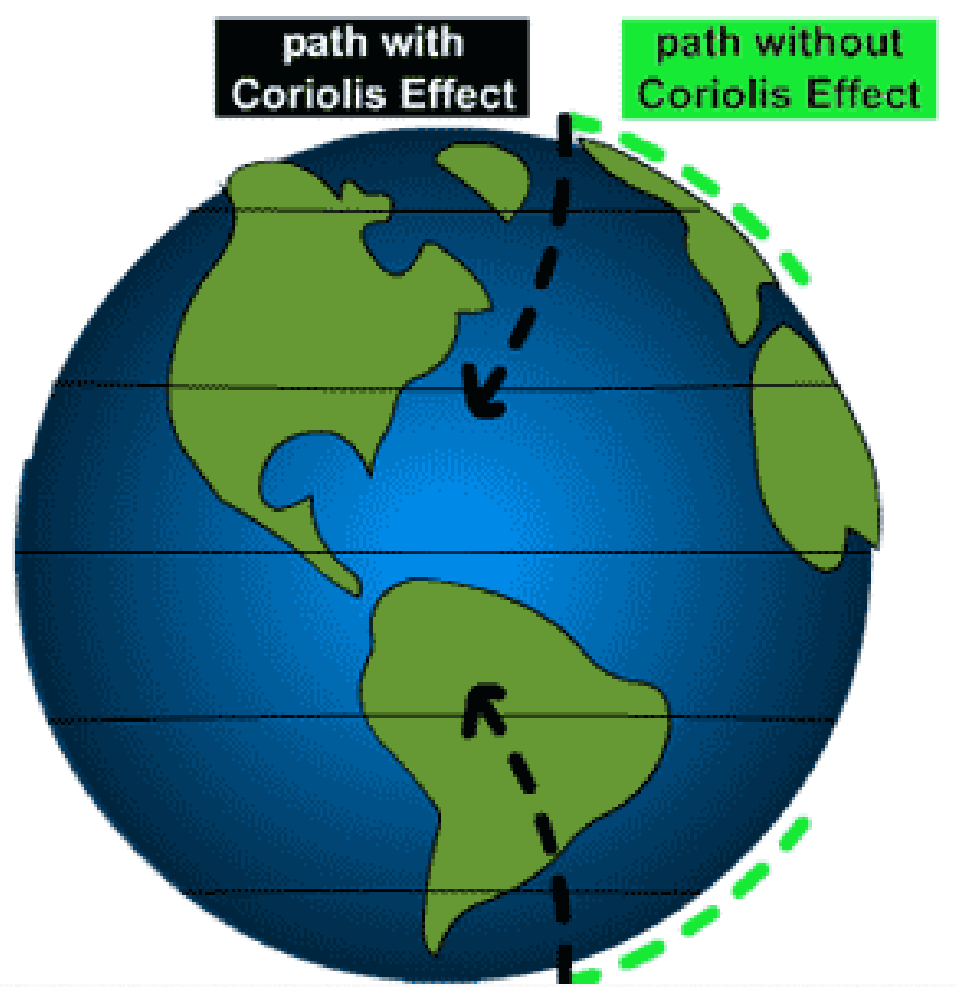
Temperatures at 5:00 p.m. Pacific Time on August 13, 2001.

Why are there not straight lines between the temperature zones?



Coriolis Effect… again!

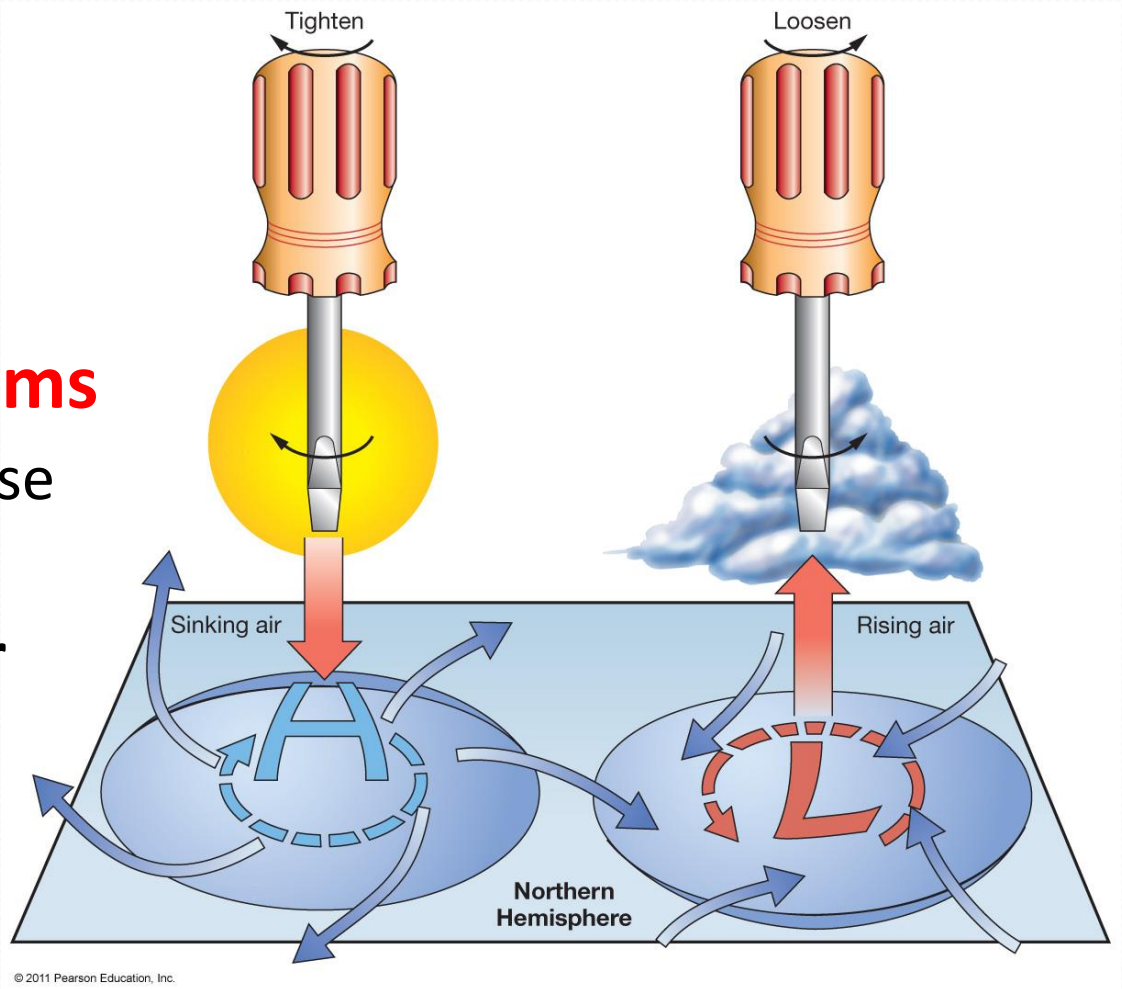
The direction of surface ocean currents affected by the Coriolis effect!



Weather vs. Climate

- **Weather – conditions of atmosphere at particular time and place**
- **Climate – long-term average of weather**
- **Ocean influences Earth's weather and climate patterns.**

- **Low Pressure Systems**
  - Wind travels Counterclockwise
  - Wind enters system
  - **Rain, Snow, Cloudy (Ugly/Sad)**
- **High Pressure Systems**
  - Wind travels Clockwise
  - Wind exits system
  - **Clear Sunny weather (Happy weather)**

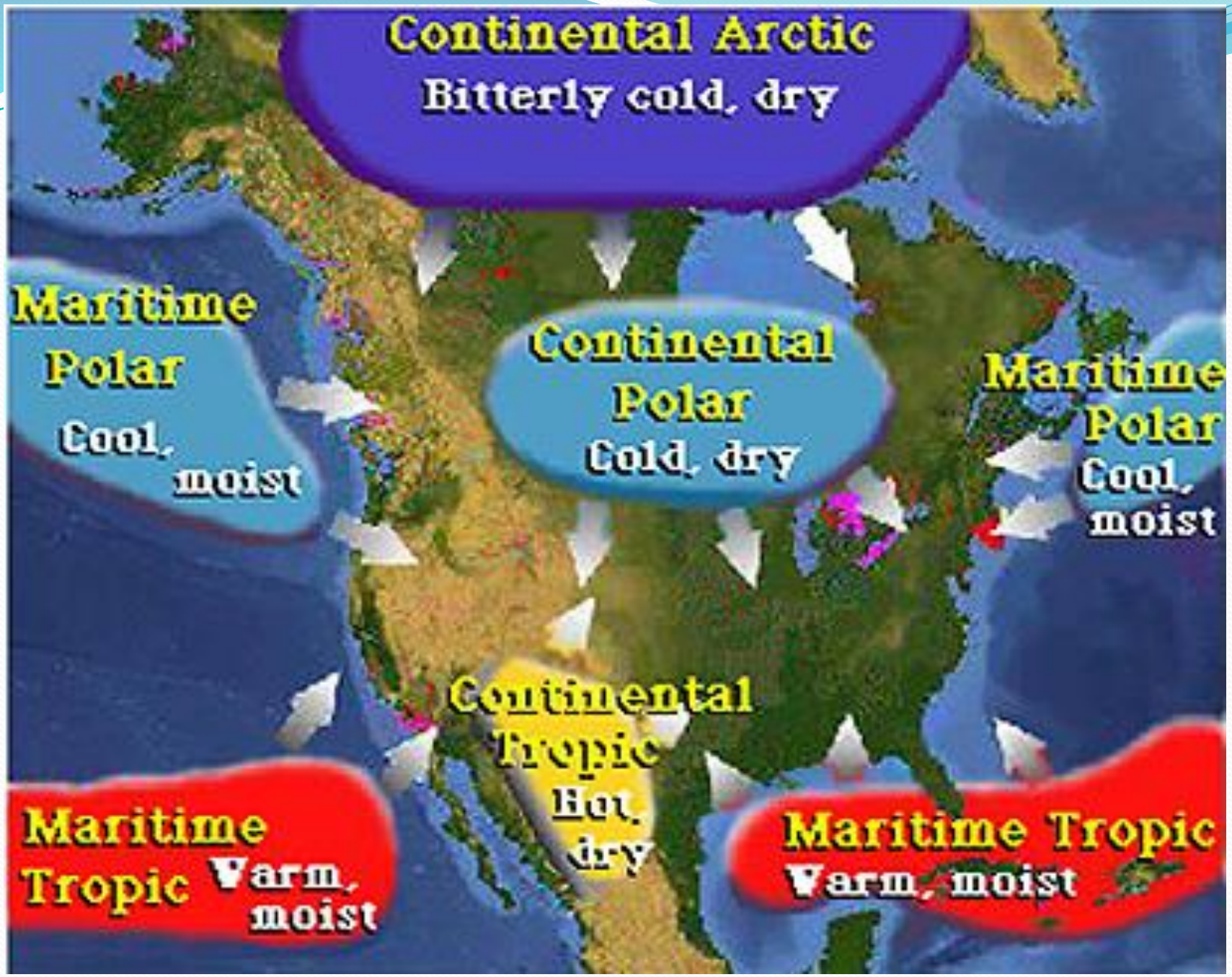


Hurricanes

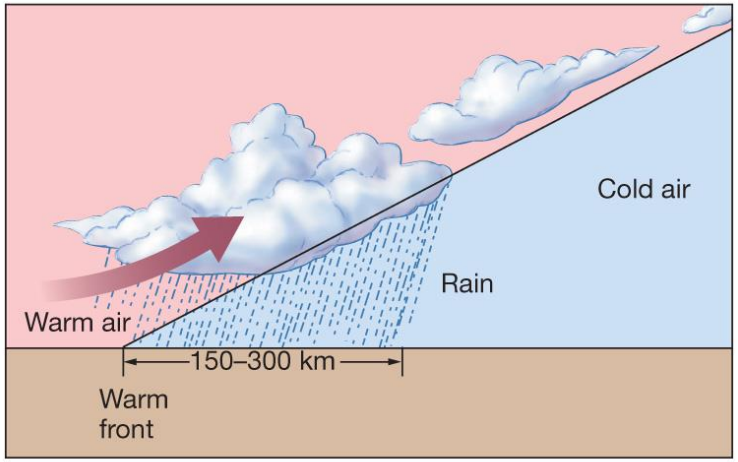
- Forms in WARM ocean waters
  - Waters near the equator
- An area of Major Low Pressure

Air Masses

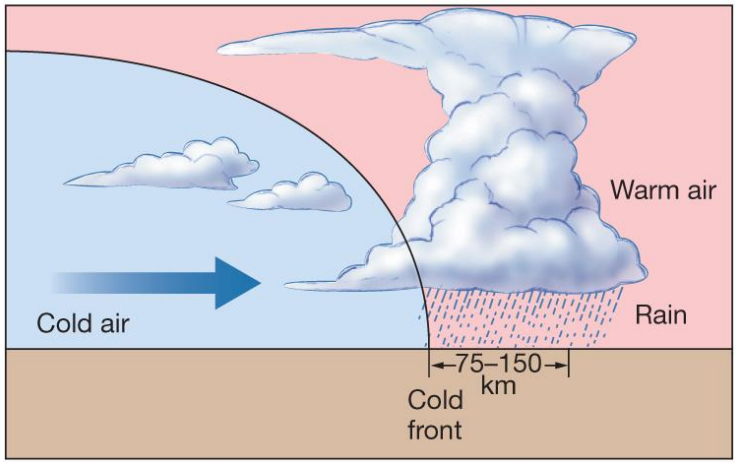
- **Air masses – large volumes of air with distinct properties**


Continental Arctic
Bitterly cold, dry
Maritime Polar
Cool, moist
Continental Polar
Cold, dry
Maritime Polar
Cool, moist
Continental Tropic
Hot, dry
Maritime Tropic
Warm, moist
Maritime Tropic
Warm, moist

Fronts



(a)



(b)

- Fronts – boundaries between air masses
  - Warm front
  - Cold front
- Storms typically develop at fronts.
- Jet Stream – controls air masses and fronts

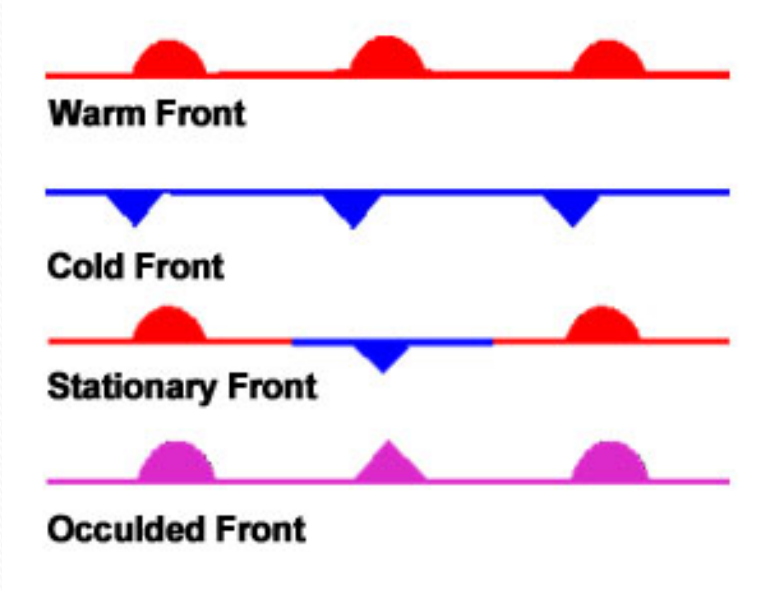
Front Types

(1) **warm front**, occurs when a warm, moist air mass slides up and over a cold air mass. (Light drizzle or rain as front passes through)

(2) **cold front**, occurs when cold polar air advances into a region occupied by warm air forcing the warm air to rise sharply. (Heavy rain, thunderstorms, and snow as it passes through.)

(3) **stationary front**, occurs when a warm air mass meets a cool air mass and the air masses do not move. (Light winds and wet weather persist/linger.)

(4) **occluded front**, occurs when an active cold front overtakes a warm front and wedges the warm front upward

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