Chapter 3

- Seasons, Weather, Climate, Extreme Weather

How does the location of the suns rays impact our everyday life?

- Temperature
- Crop growth
- Location of cities

Why does it affect these things?

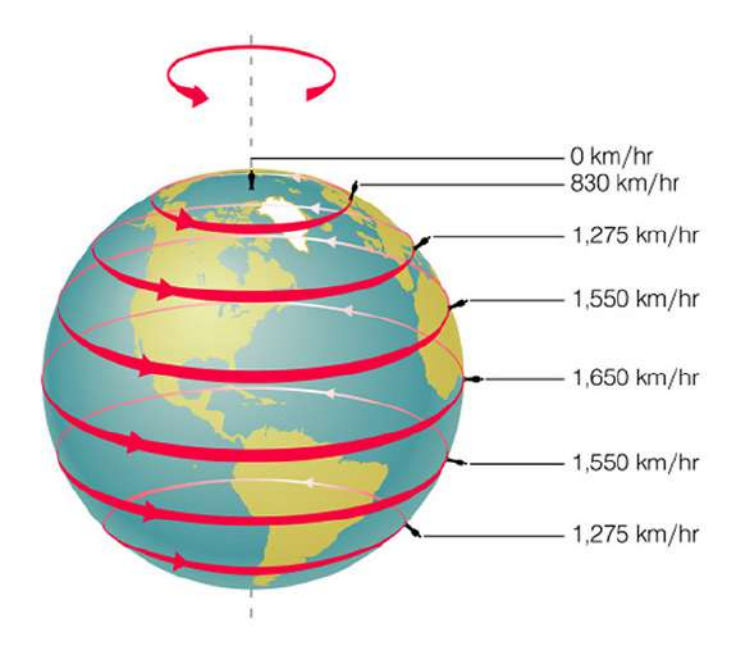
Earth / Sun Relationships

What is the difference between rotation and revolution?

Rotation

1 spin around the axis =

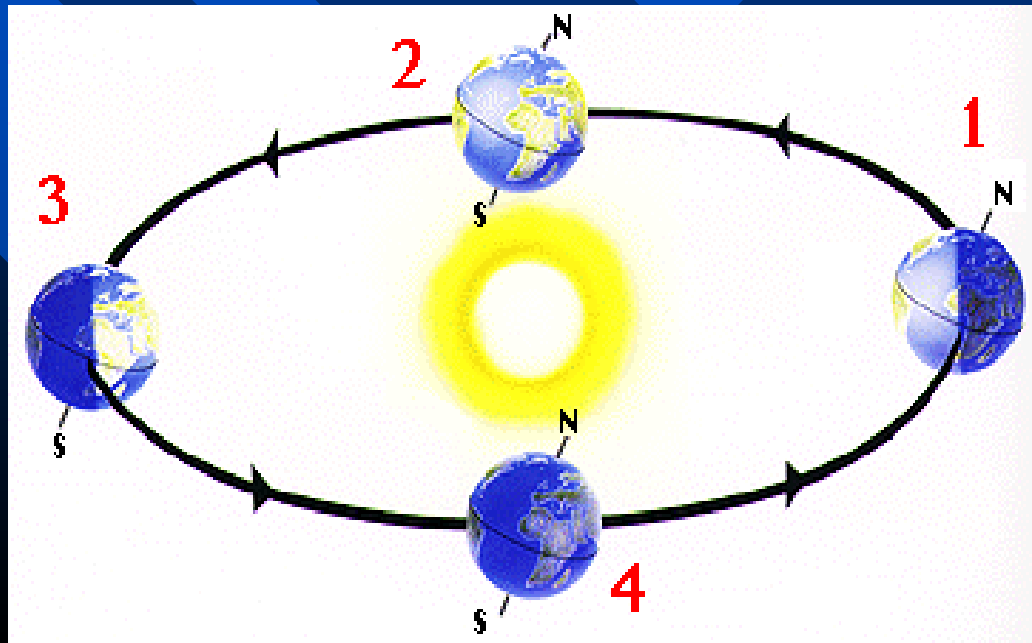
24 hours/1 day



Revolution

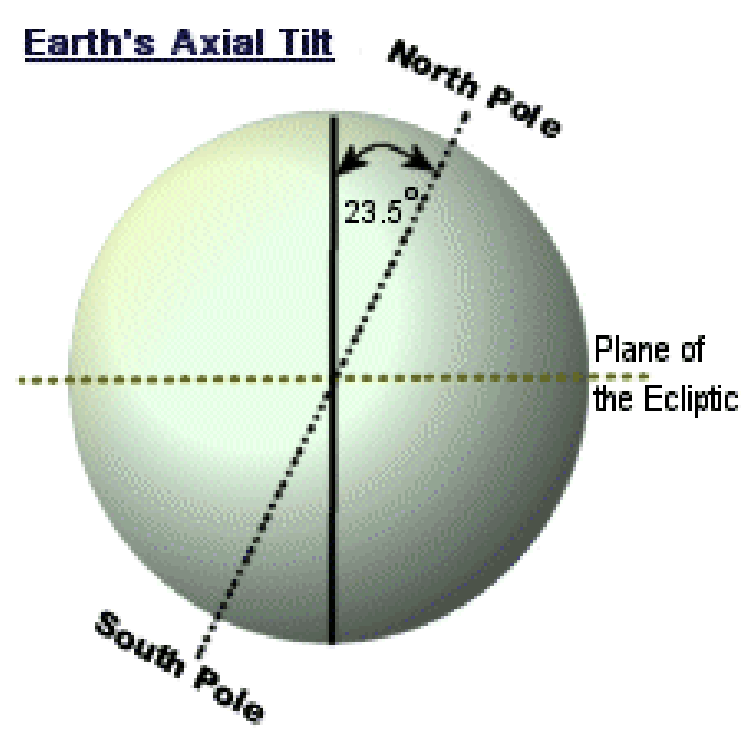
1 time around the sun =

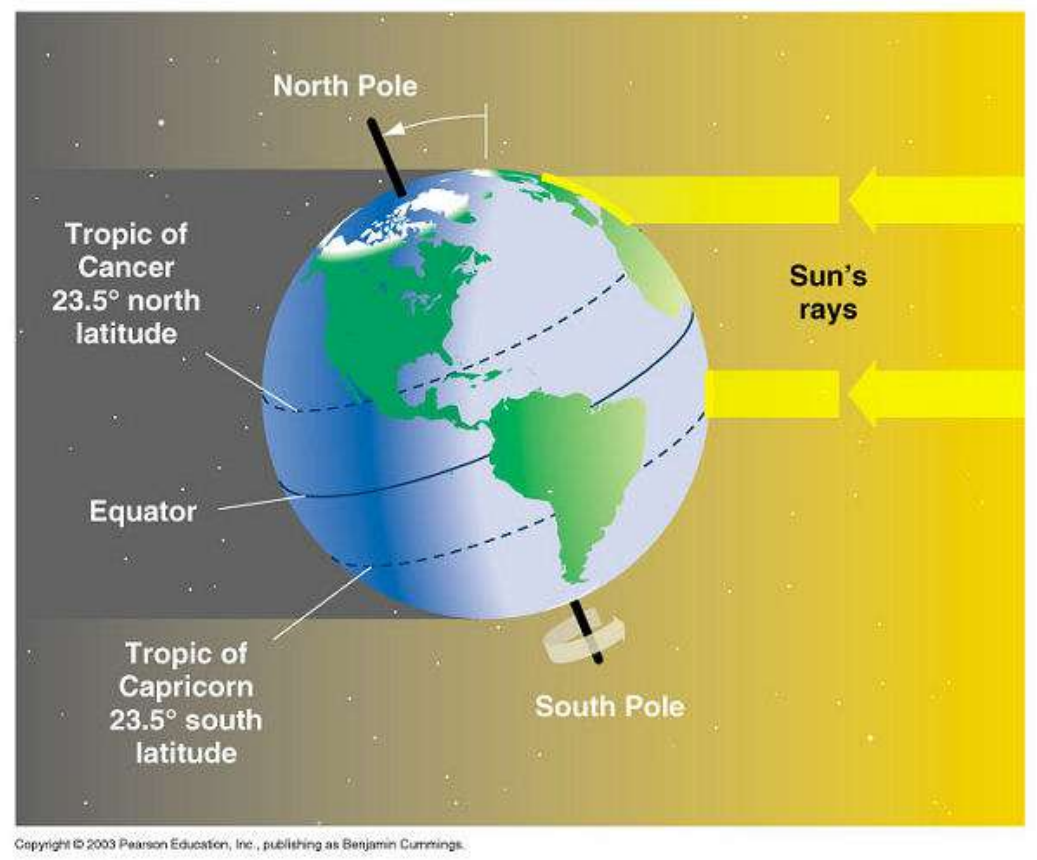
365.25 days/1 year



Why do we have **Seasons**?

- Earth's revolution and axial tilt change the amount of sunlight that parts of the Earth get from the sun.
- Axial tilt – 23.5* tilt





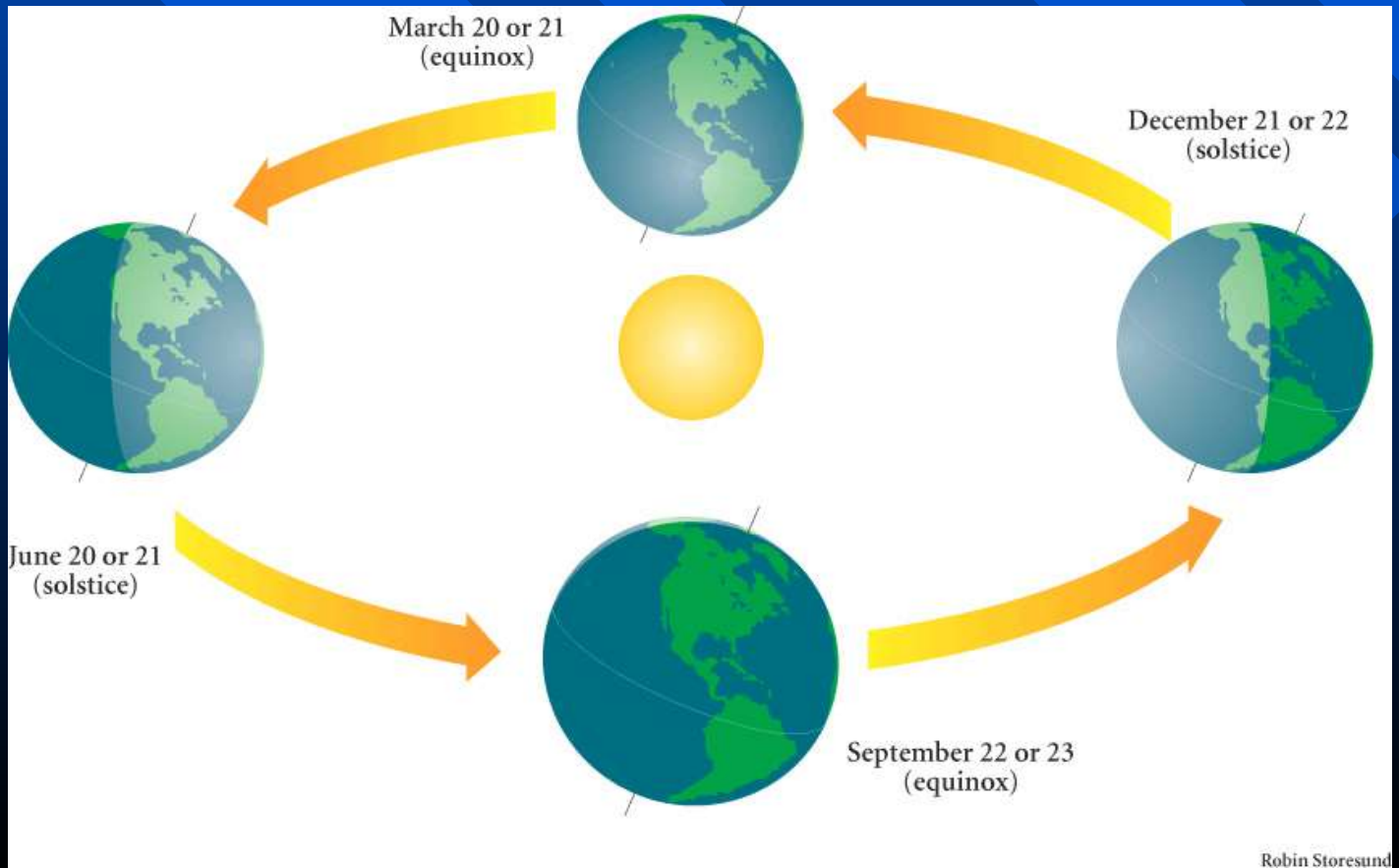
When do the Seasons Begin?

EQUINOX – Sun overhead at noon at Equator. Days and nights are same length.

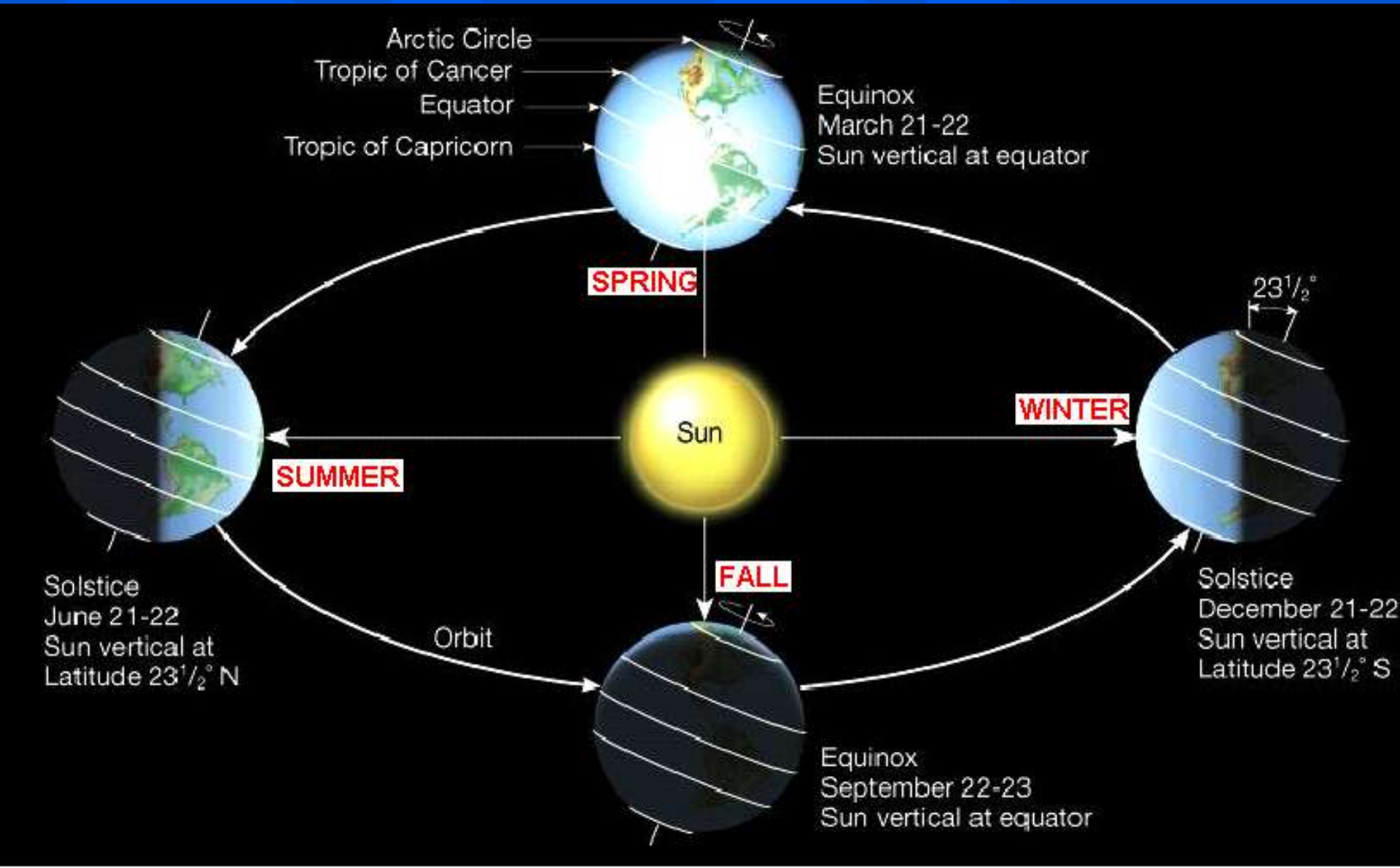
Spring Equinox - March 21, Fall Equinox - September 23

SOLSTICE – Sun overhead at noon at Tropics. Longest day in summer, shortest day in winter.

Summer Solstice - June 20 or 21, Winter Solstice - December 22 or 23



How do these pieces fit together?

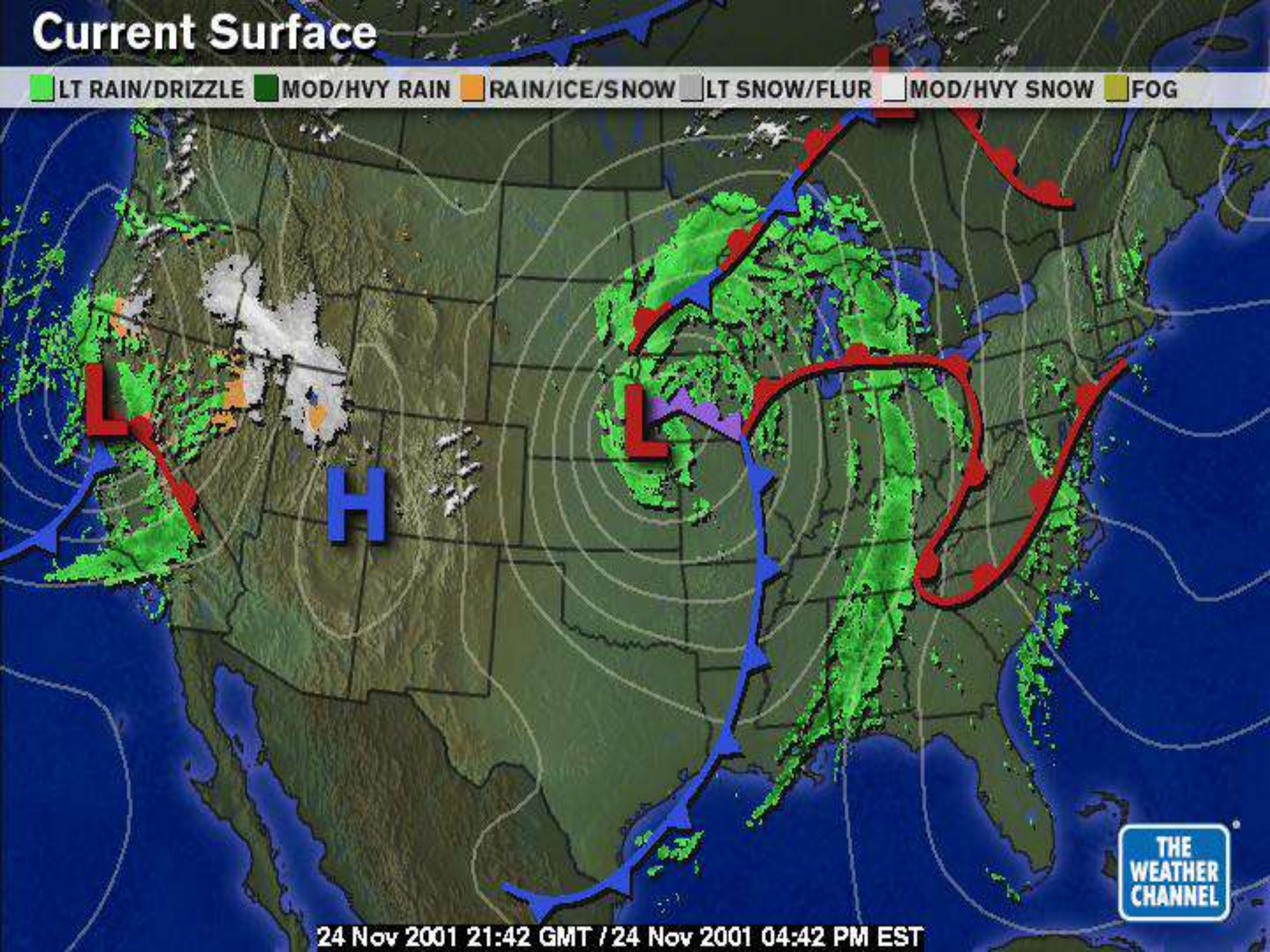


What is **meteorology**?

- study of “day to day atmospheric conditions”
- Weather!

What are the four elements of weather?

- Temperature
- Cloud cover
- Wind
- Precipitation


Current Surface
LT RAIN/DRIZZLE
MOD/HVY RAIN
RAIN/ICE/SNOW
LT SNOW/FLUR
MOD/HVY SNOW
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THE WEATHER CHANNEL
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El Niño and La Niña

A periodic change in the pattern of mid-Pacific ocean currents and water temperatures can cause trade winds to diminish or even change direction, leading to worldwide climate alterations.

The El Niño phenomenon generally occurs during December or January, around the Christmas season, so Peruvian sailors nicknamed the event after the Christ Child–*el niño santo*, “the holy little boy” in Spanish.

El Nino & La Nina

El Nino

Warming of the water in the Pacific Ocean

High Pressure

Every 3-7 Years

Affect on U.S.?

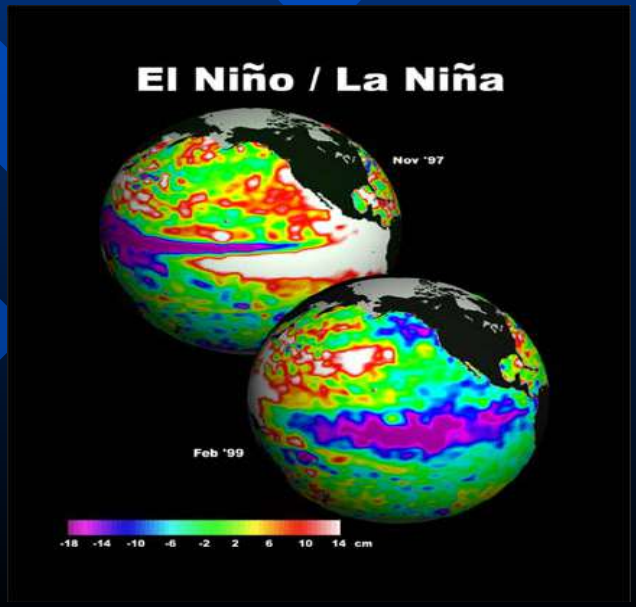
Heavy Rain or Drought

La Nina

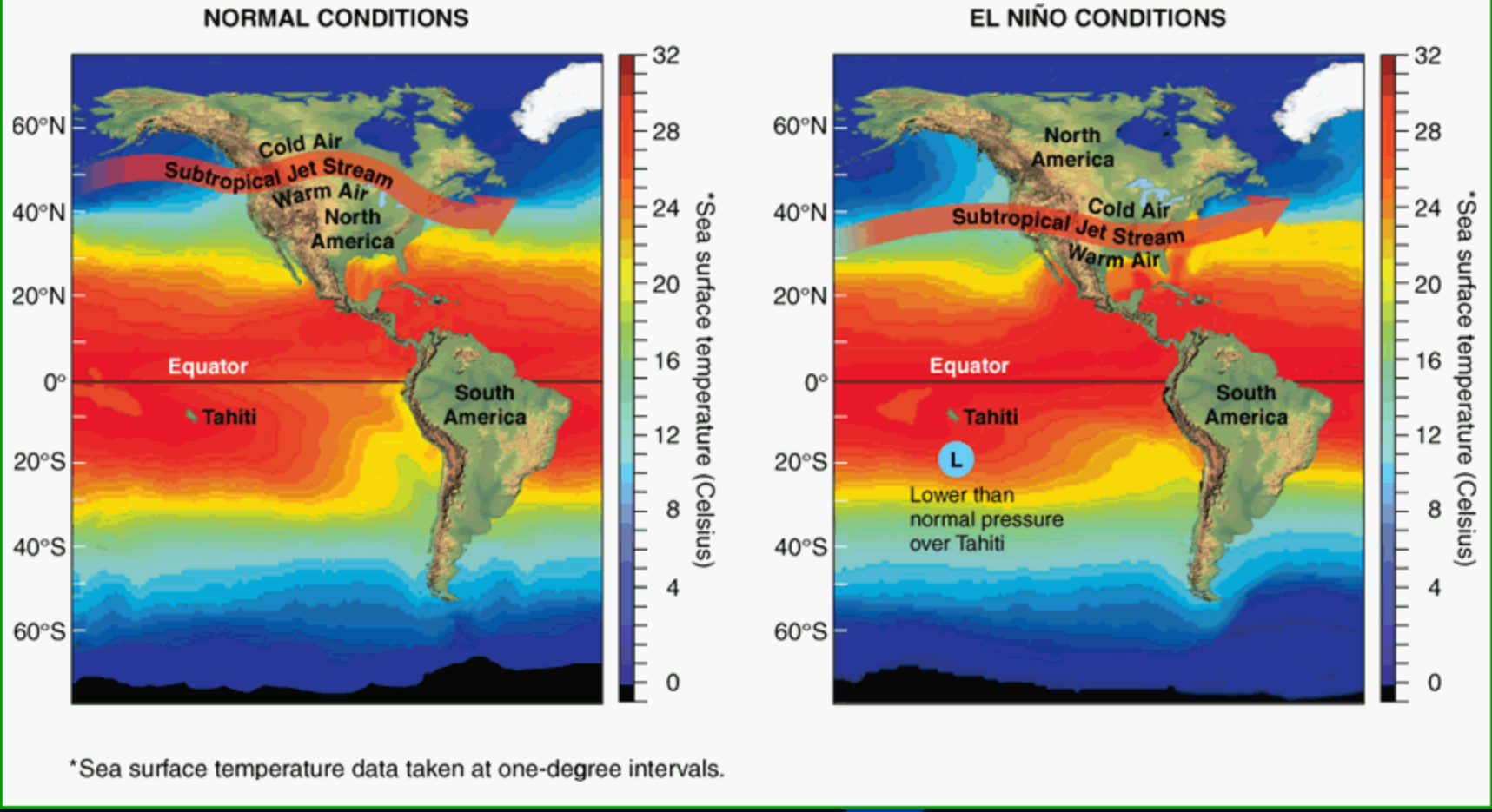
Cooling of the water in the Pacific Ocean

Low Pressure

Every 3-7 Years



El Niño



*Sea surface temperature data taken at one-degree intervals.

Discussion Question

What kinds of effects do El Niño phenomena have on the earth's people?

El Niño phenomena causes increased precipitation and warmer winters along the coasts of North and South America. This may cause flooding in some areas, increase storm damage, lead to crop failures from drought, and make desert areas bloom with wildflowers. Droughts in Southeast Asia and Australia cause massive forest fires, and their smoke spawns additional weather phenomena and adversely affects human health.

Climates of the Earth

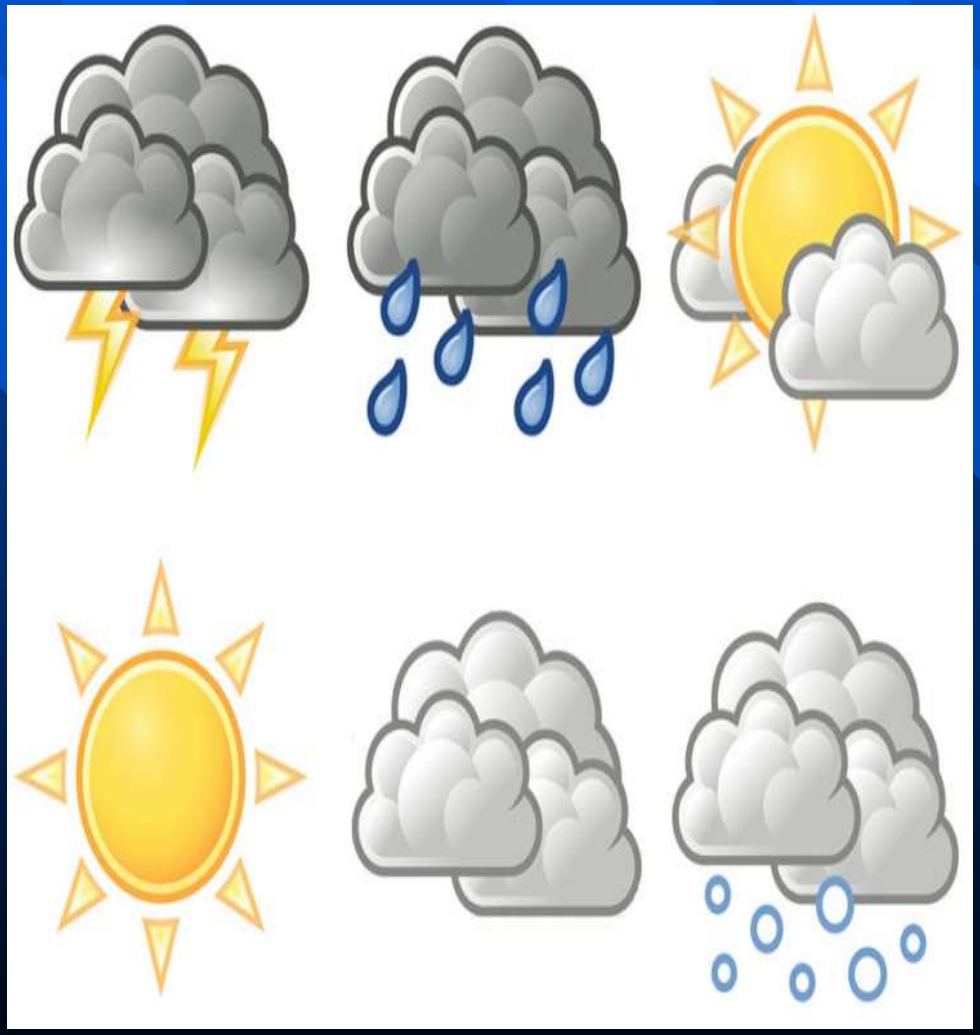
Farmers depend on the weather and have learned to adapt to normal climate variations.

They choose certain crops and plant at certain seasons, according to their knowledge of local weather patterns.

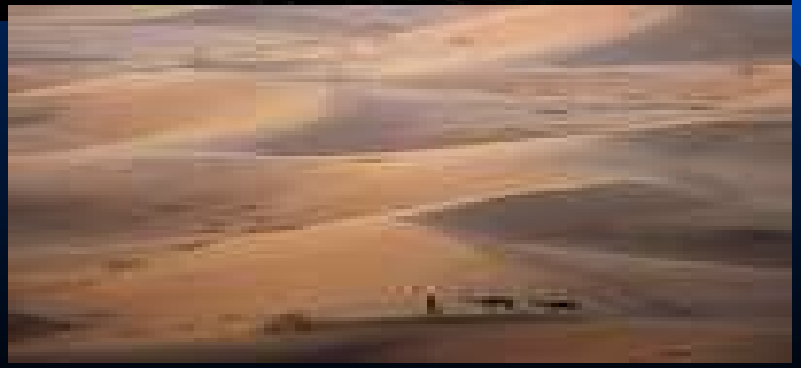
In an El Niño year, the weather may be dramatically different, causing crop failures and therefore food shortages.

El Niño years also may cause damaging storms or severe droughts.

Common Weather Symbols



Difference between Weather and Climate?



- **Weather** = Day to day conditions of the atmosphere

- **Climate** = Conditions of the atmosphere over long term

What is **Climate**?

- average condition of weather based on minimum 30 years of statistics

Climatology- is the study of climate

Climate affects everything!!!

- vegetation, soils, landforms, and water resources, and many human activities

- What are **climate regions**?

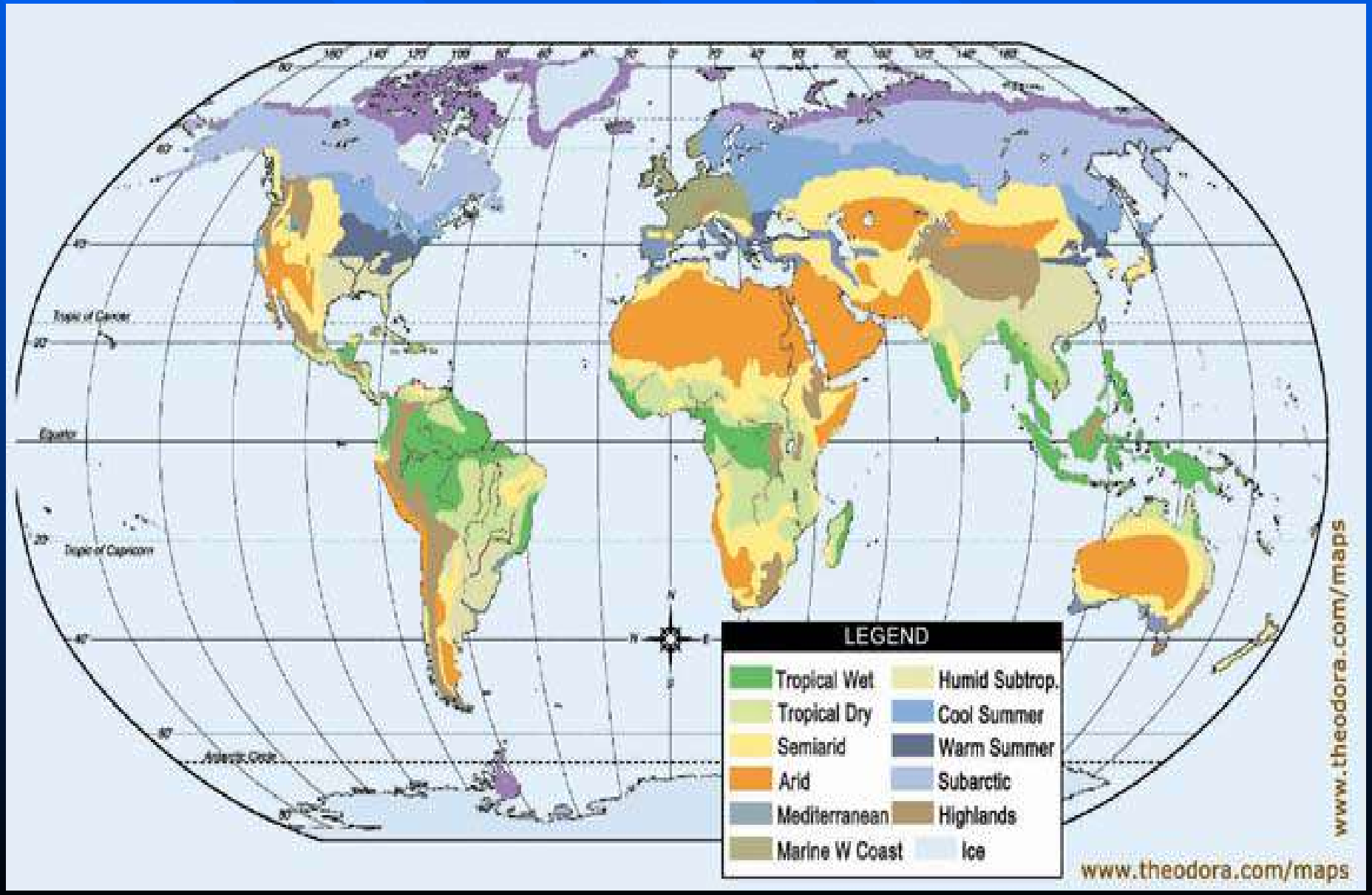
climate characteristics are similar

-

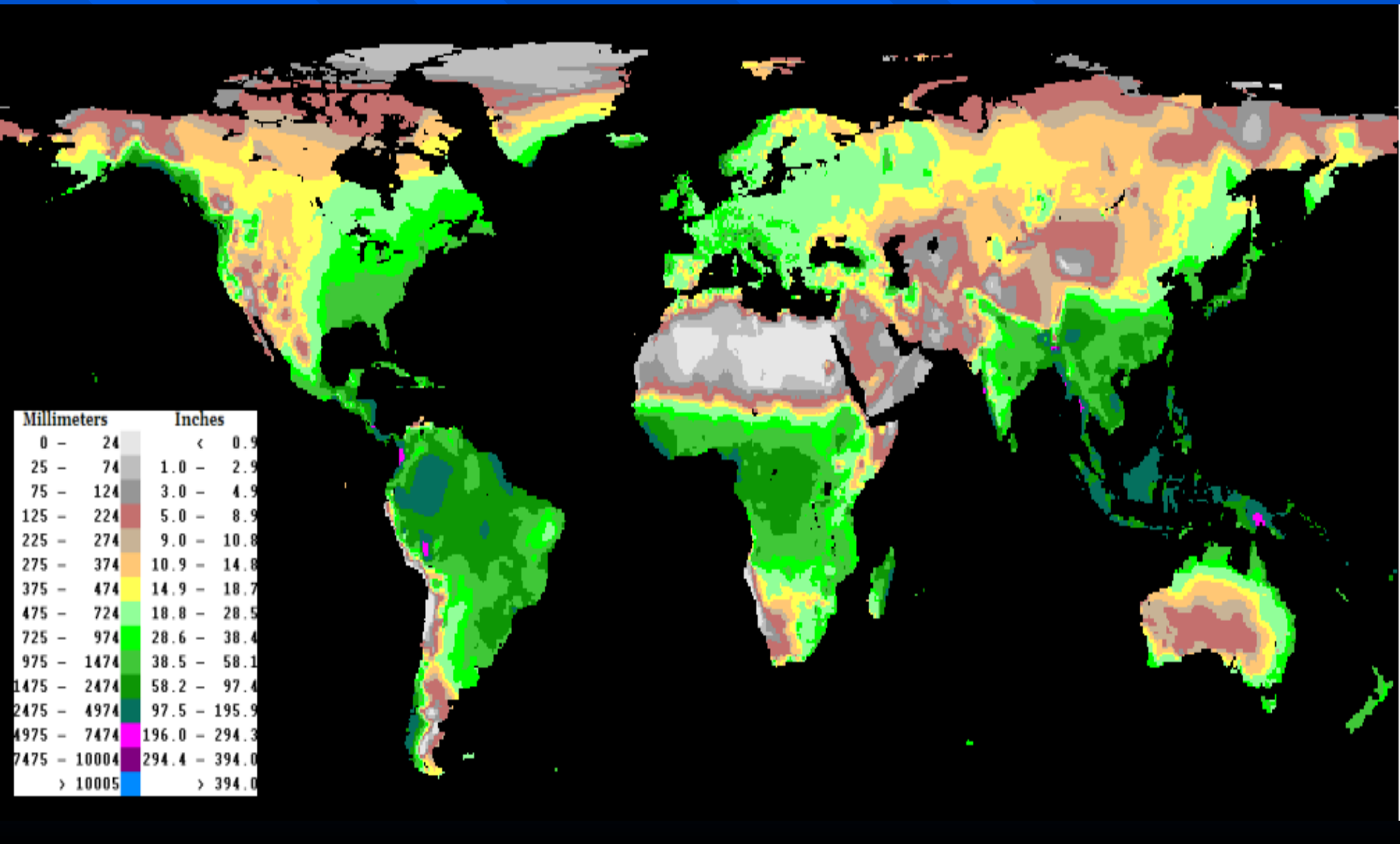
Boundaries are gradual instead of sharp lines

You cant just take one step and be out of a desert!

Thematic Map : World Climate Regions

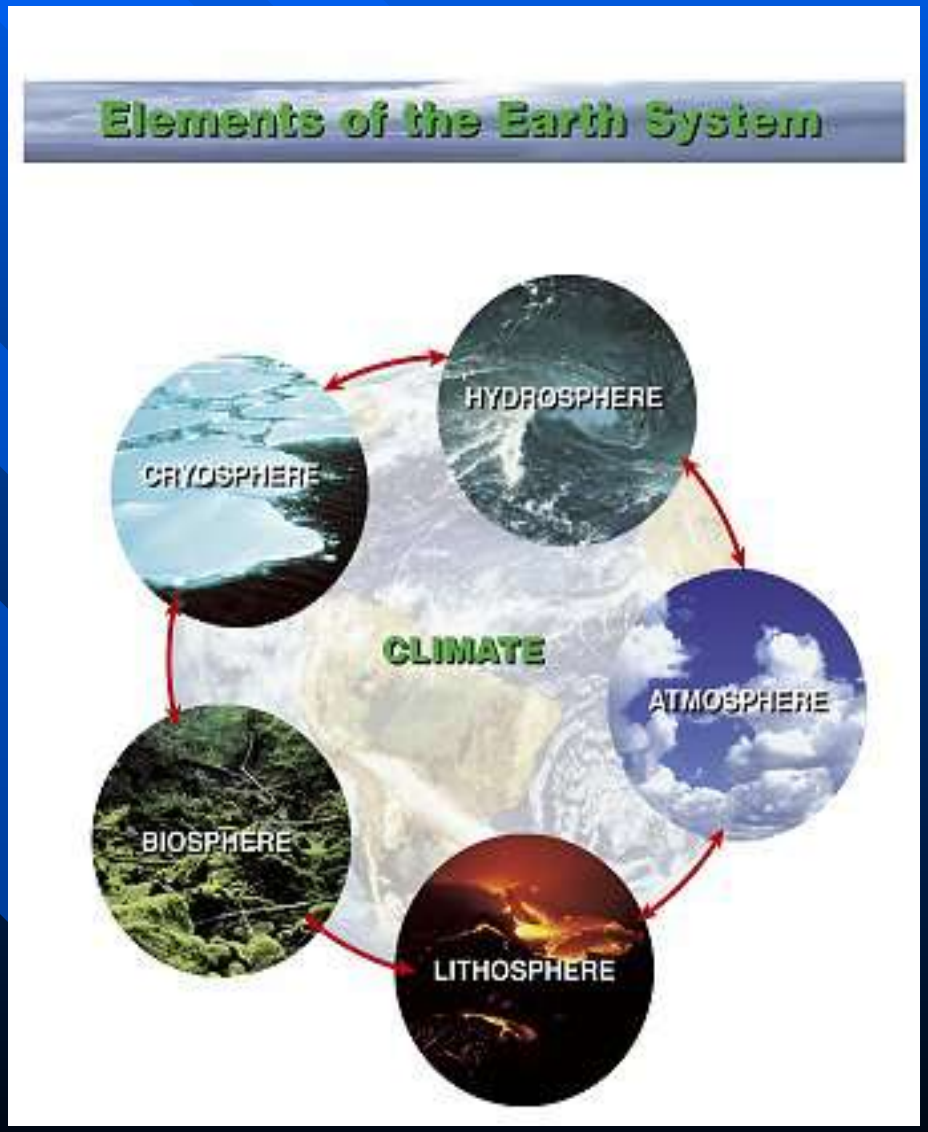


Precipitation around the World

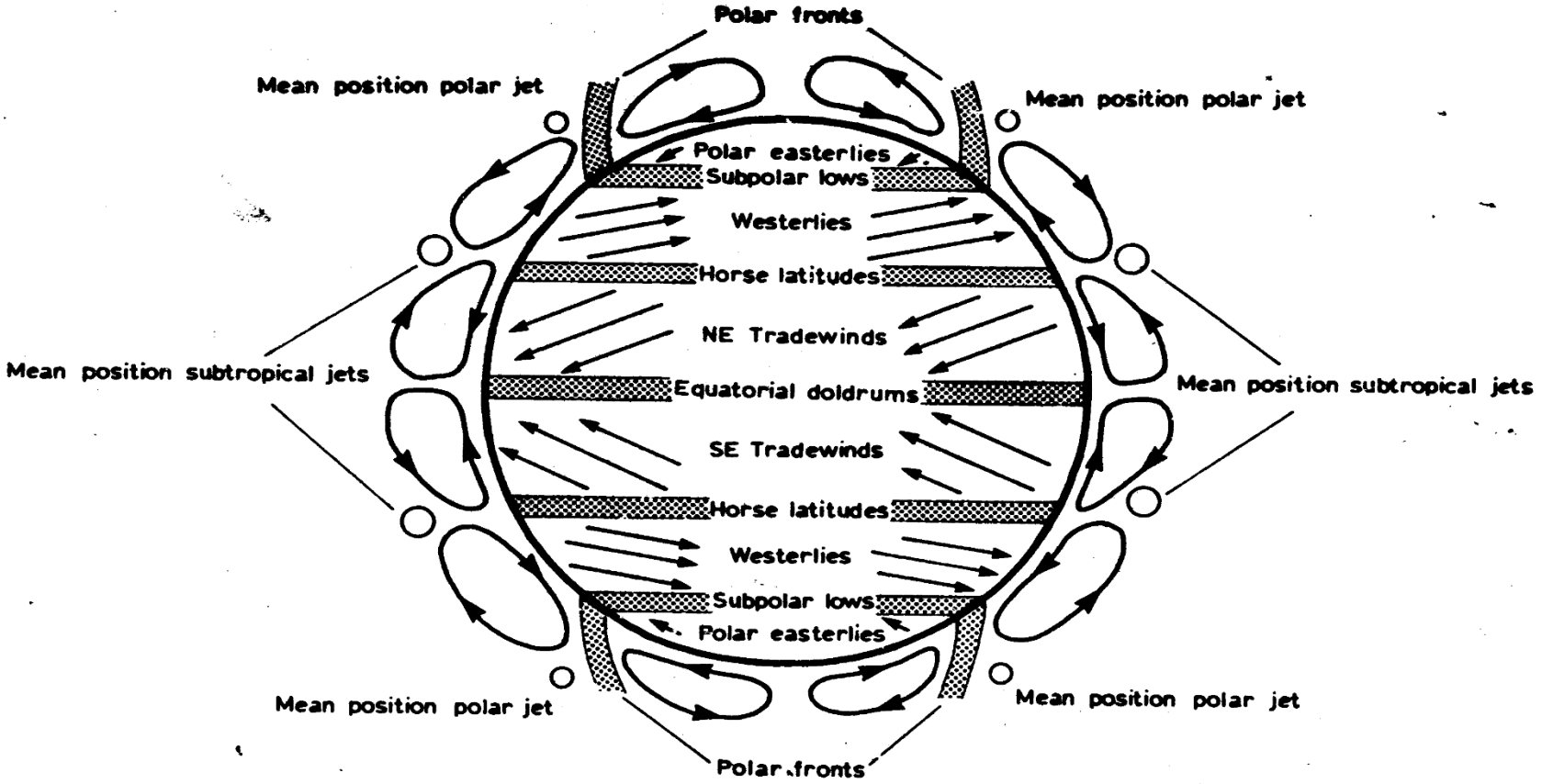


What factors affect climate?

- Wind
- Ocean Currents
- Latitude
- Elevation
- Topography

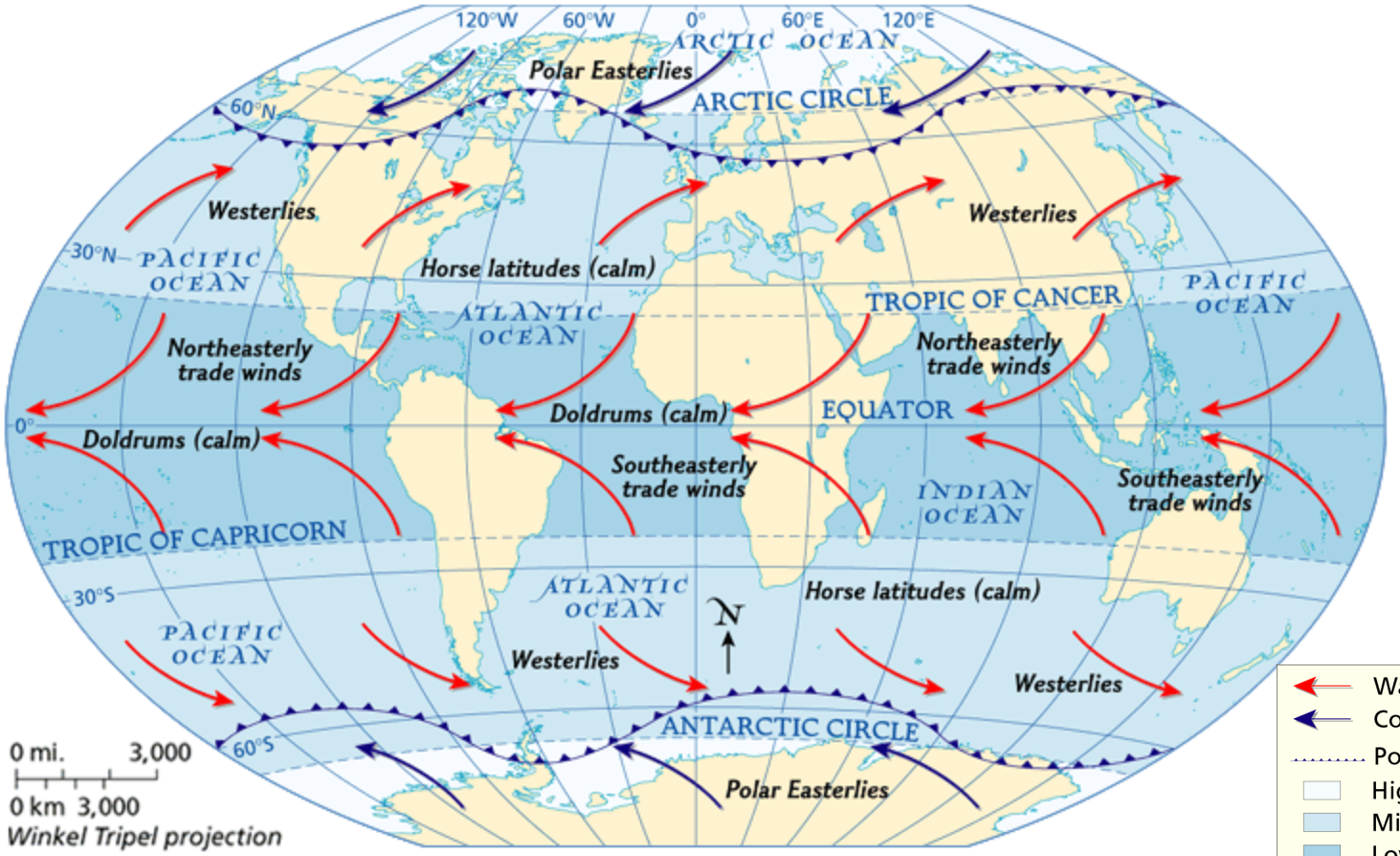


Review: Global Wind Currents

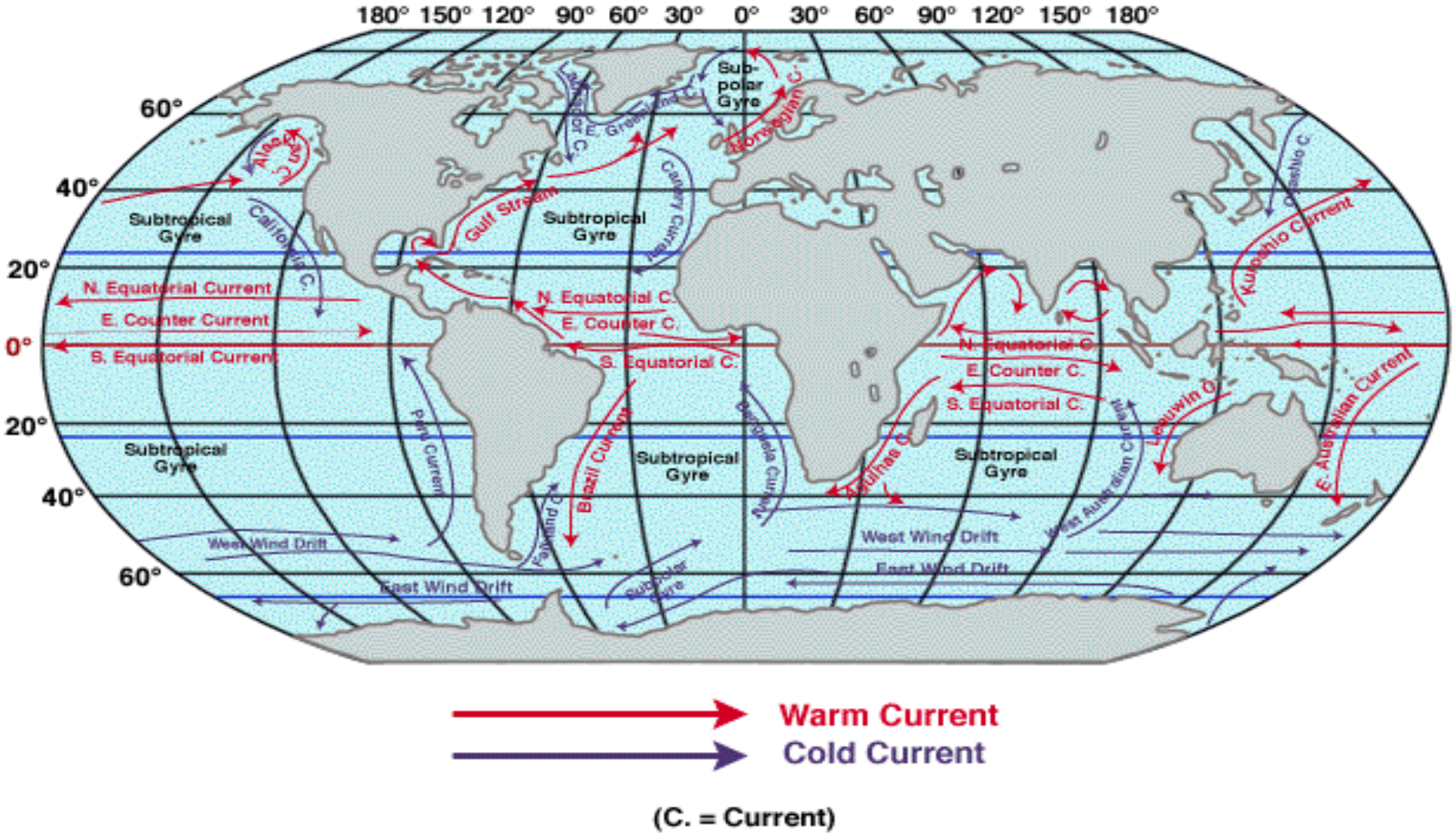


General Circulation of the Atmosphere

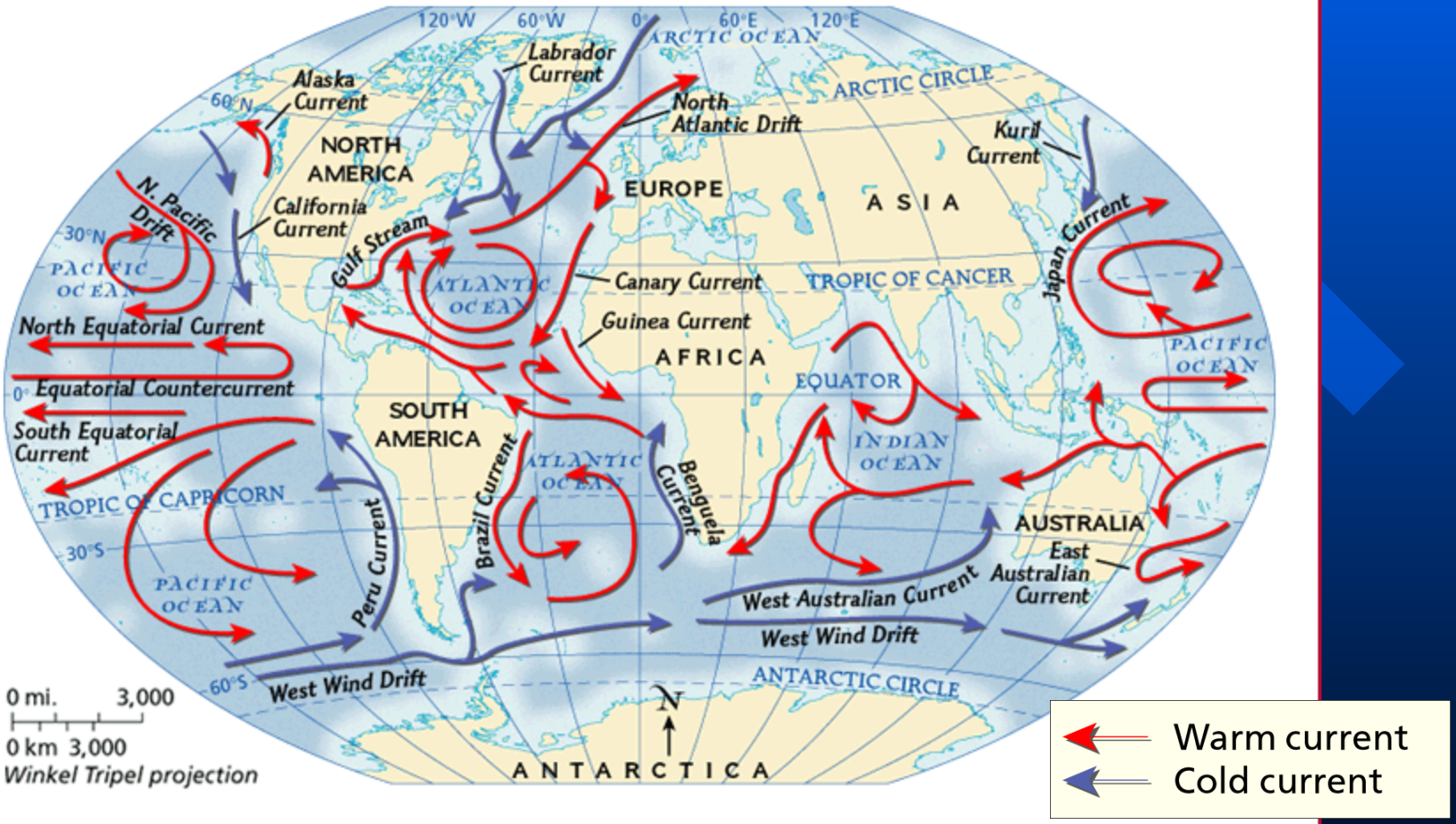
World Zones of Latitude and Wind Patterns



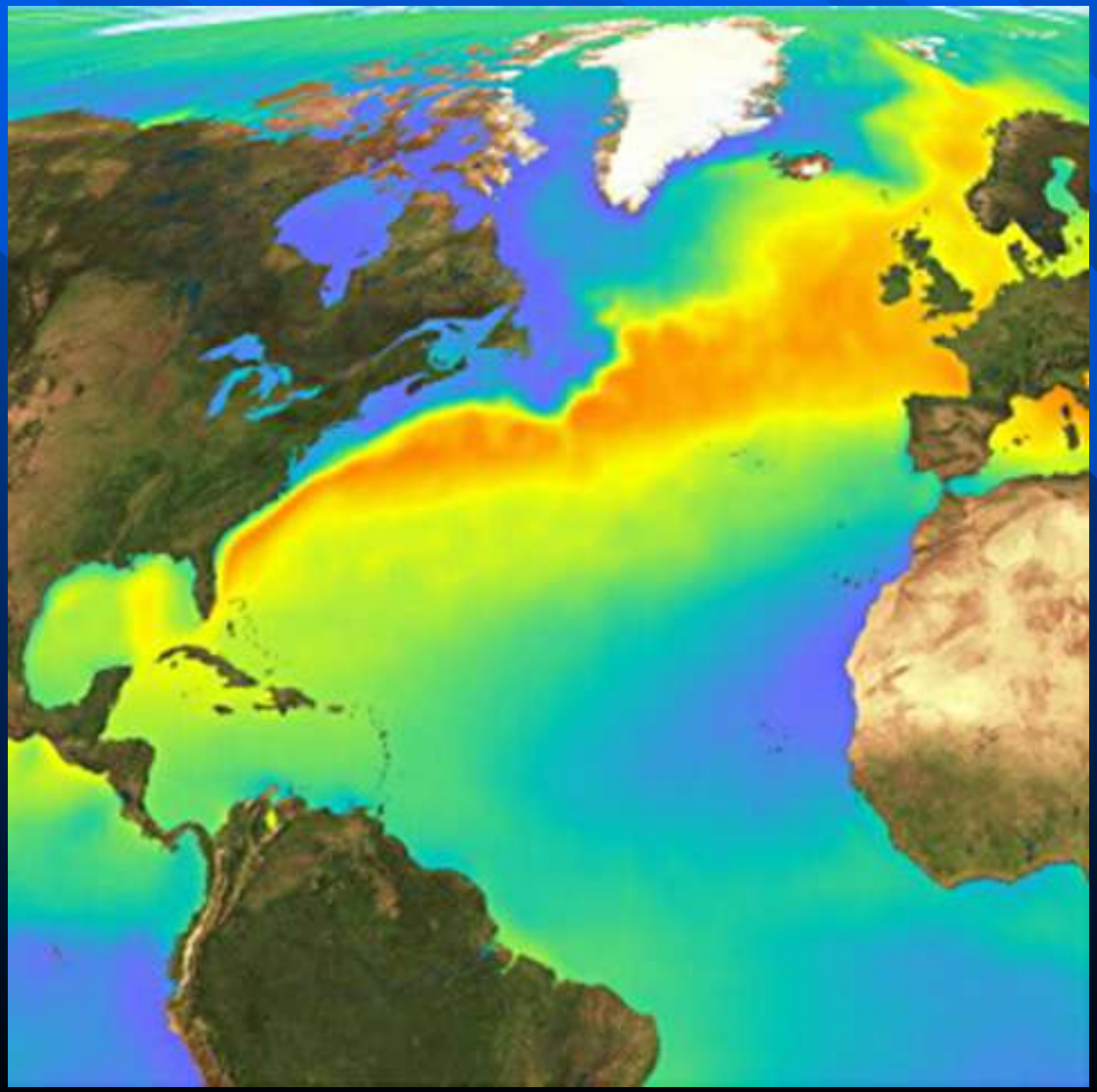
Review: Global Ocean Currents



World Ocean Currents



Gulf Stream



How does latitude affect climate?

- Further from equator is colder!!!

- **3 latitude zones of climate**?
  - Low or tropical (0* - 23.5* N/S)
  - Middle or temperate (24* - 66.5* N/S)
  - High or polar (66.5* - 90* N/S)

How does **elevation** affect climate?

- **Elevation** - distance above sea level
- As altitude/elevation increases, air temperature drops 3.5 degrees per 1,000 ft.
- 12,000 ft. and above are arctic climates

Elevation and Climate (cont.)

Discussion Question

Explain why high mountaintops are always covered by snow, even in the Tropics.

The thinner atmosphere in higher altitudes retains less heat. Therefore, temperatures are lower at high altitudes. If the mountaintops are high enough, it will always be too cold for the snow to melt.

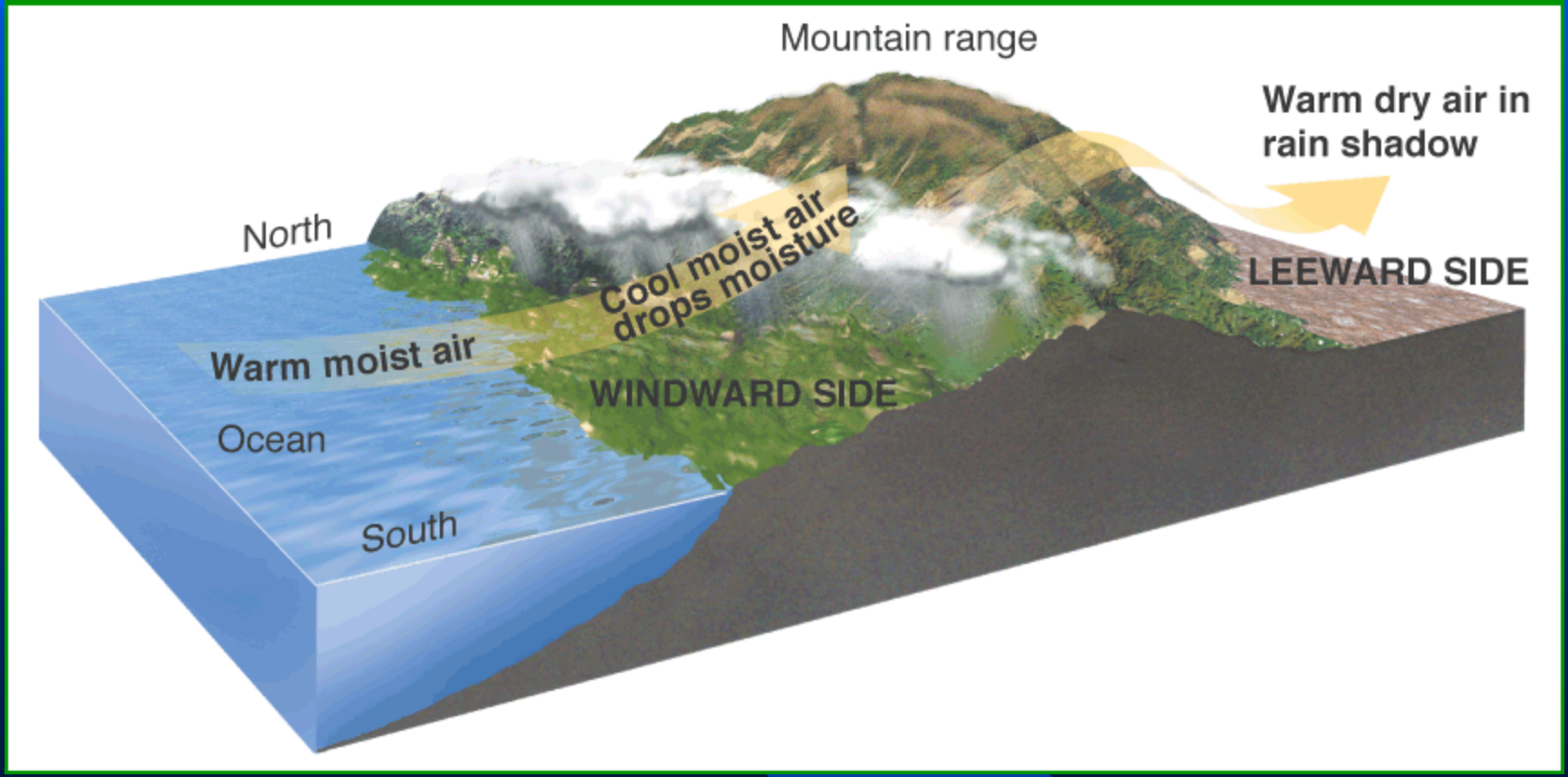
How does **topography** effect climate?

- Various landforms affect climate

Can you think of any examples?

- Great Lakes
- Major rivers
- Mountains

The Rain Shadow Effect



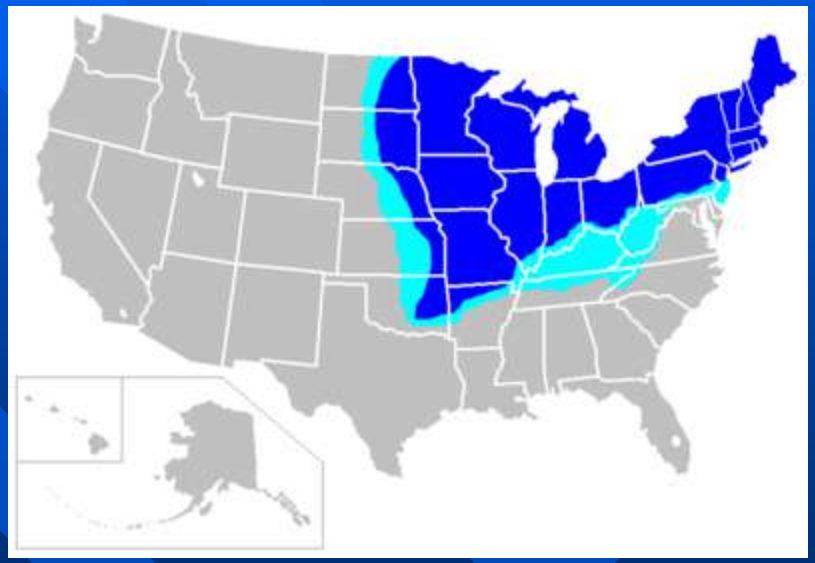
Climate Region Review

Tropical Wet

- hot avg. temp 80
- avg. 80 inches of rain per year

Humid Continental

- Large variety in temperature
- mid-latitudes
- Northern Hemisphere
- Four Seasons



Semiarid

- Not much rain, 16 inches avg. per yr.
- Hot Summers
- Mild/Cold Winters
- Can support a productive agriculture

Desert

- Less than 10 inches of rain per yr.
- Hot or Cold

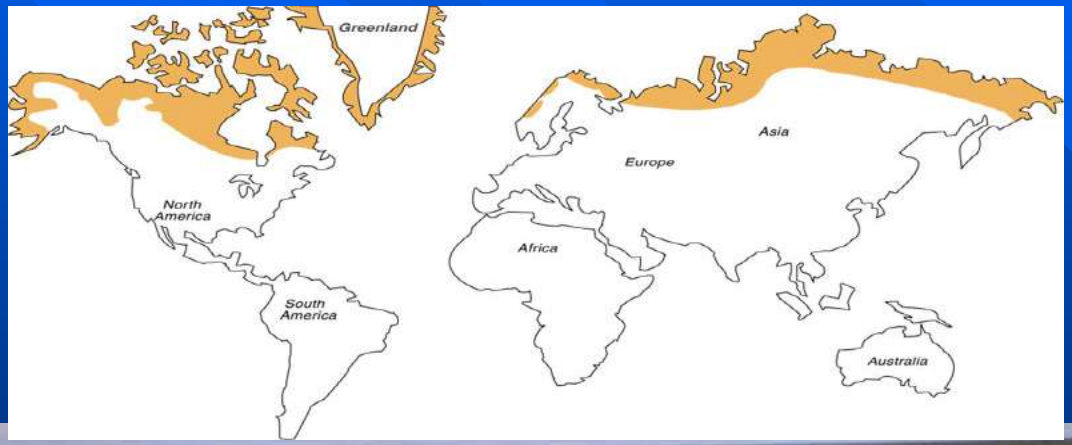
Humid Subtropical

- Long summers
- Hot and Humid
- Located on the east coasts of continents
- Southeast U.S. is an example

Tropical wet and dry

- Rainy season during summer
- Dry season during winter
- Located near tropical wet climates in Africa, South and Central Am. & Asia

Tundra



- Flat, treeless, ring around the Arctic Ocean
- Less than 15 inches of precipitation a year
- Permafrost soil- always frozen

Critical Thinking

Q **Predicting Consequences** Without the Coriolis effect, how might the earth's climates be different?

A Climates would be more extreme, or not as mild.

Climate Regions (cont.)

Discussion Question

Which of the climate regions do you think are most heavily populated? Why do you think so?

Mid-latitude and tropical regions are the most heavily populated. Mid-latitude climate regions tend to be temperate, and the tropical climate regions are generally warm to hot with lush vegetation.

Reviewing Facts:

Earth-Sun Relationships

Q What are the effects of the earth's tilt, rotation, and revolution?

A All cause changes in the way the sun's rays strike the earth, leading to day-night, seasons, and climate variations.

Reviewing Facts:

Factors Affecting Climate

Q List three key factors that affect climate.

A The three key factors that affect climate are latitude, air and ocean currents, and landforms.

Extreme Weather

- Hurricanes
- Tornadoes
- Floods
- Drought
- Blizzards

What is a **hurricane**?

- extreme low pressure storm - begins over warm water

How are hurricanes formed?

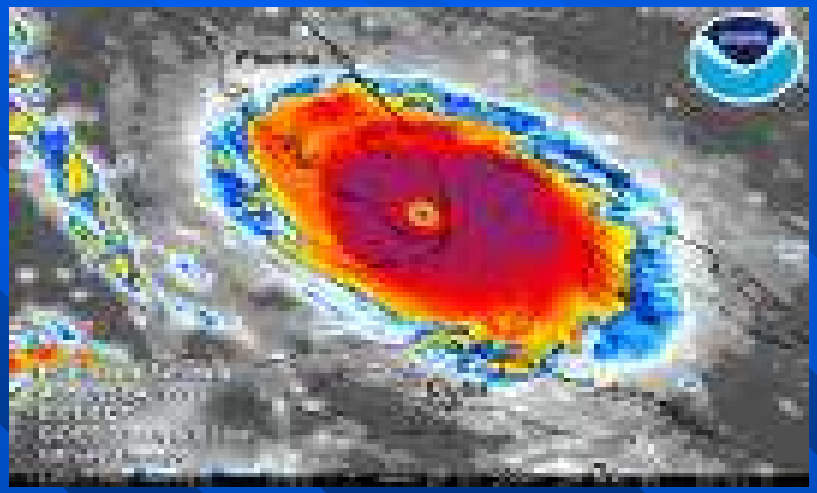
- Very Low Pressure
- Warm Ocean Waters

What are the 3 classes of Storms?

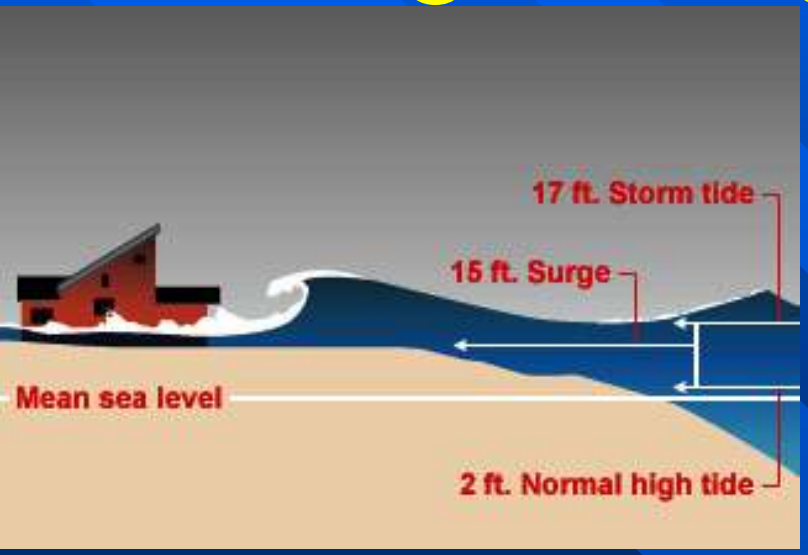
1. **Trop. Depression**
2. **Trop. Storm**
3. **Hurricane**

What is a hurricane in the Pacific Ocean called?

- **Typhoon**



What causes most of the damage during a hurricane?



- **Storm Surge** – Rising Ocean levels due to increased winds
- One foot of water for every 10 mph. Of wind

How do we rank a hurricanes' strength?

Saffir-Simpson Scale

Category	Wind (mph)
1	74-95
2	96-110
3	111-130
4	131-155
5	>155

Tornadoes – What causes them?

Strong cold fronts collide with strong warm fronts

Circular winds develop and strengthen

Where do most **tornadoes** occur?

How do we measure tornadoes?

- By the amount of damage caused

FUJITA SCALE

	Wind speed	Damage
F0	40-73 mph	Light
F1	74-112 mph	Moderate
F2	113-157 mph	Considerable
F3	158-206 mph	Severe
F4	207-260 mph	Devastating
F5	261-318 mph	Incredible