

Climate, Weather, and Life – Ch. 3

Lesson 2



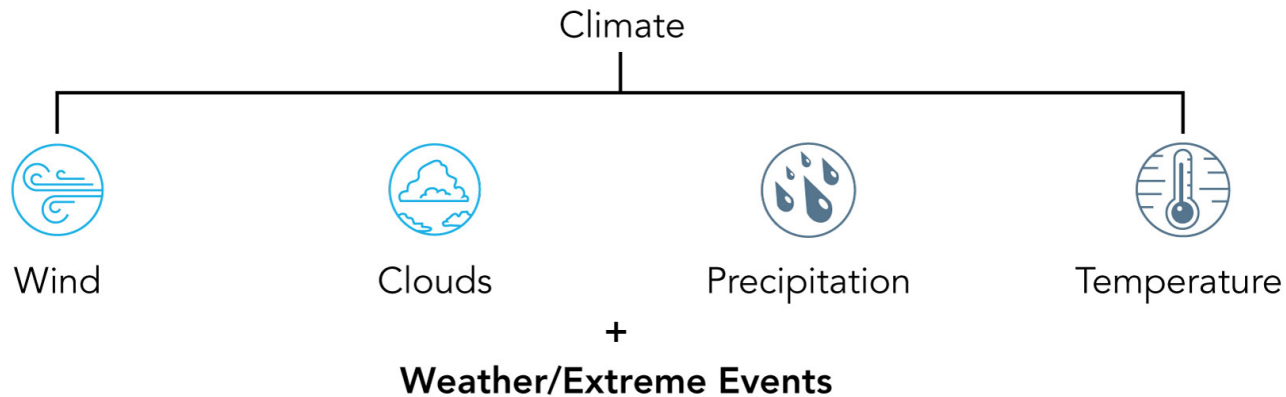
Climate and Weather

Climate: long-term patterns and averages of temperature, precipitation, clouds, and wind over many years

- Includes the frequency of extreme weather events such as heat waves, droughts, and floods

Weather: short-term changes in temperature, precipitation, clouds, and wind from day to day

- Can change rapidly and can be tough to predict

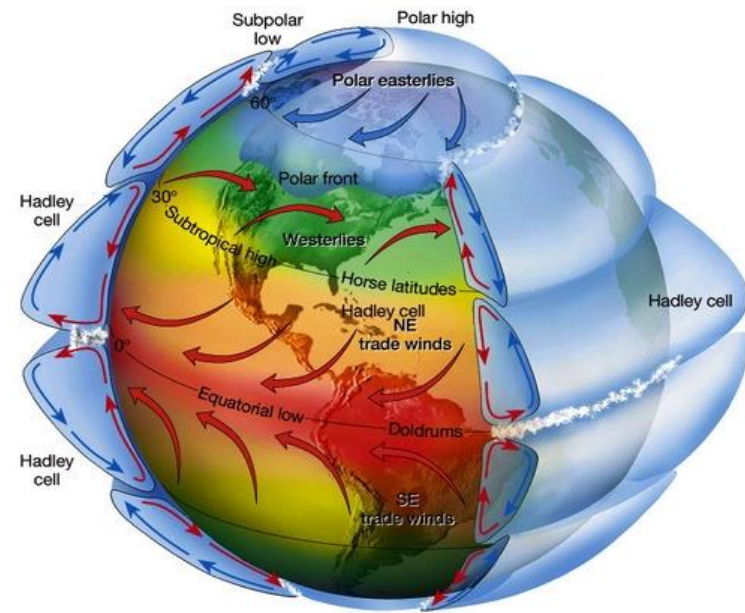
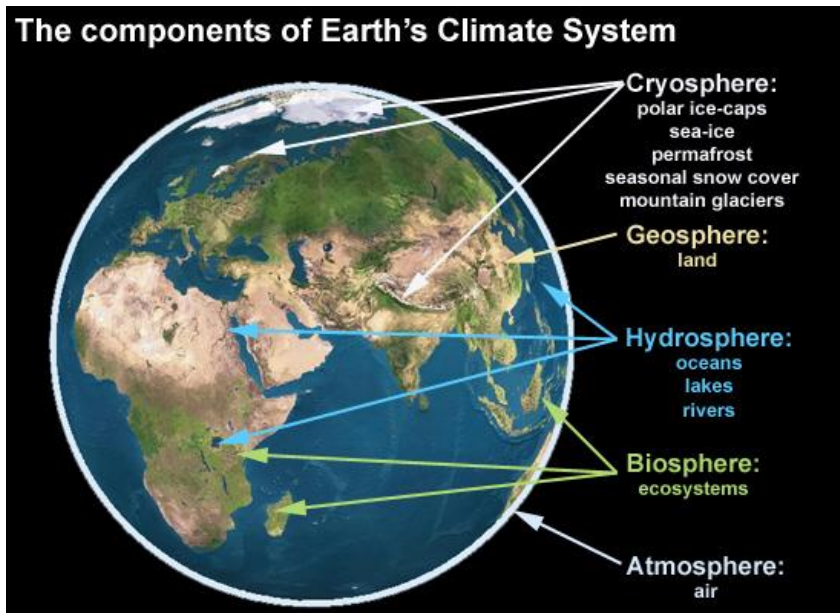


Weather and climate also shape populations, communities, and ecosystems.

The Global Climate System

Climate and weather are produced by a global climate system composed of winds and ocean currents.

- The global climate system is powered and shaped by the total amount of solar energy retained in the biosphere as heat, and by the unequal distribution of that heat between the equator and the poles.

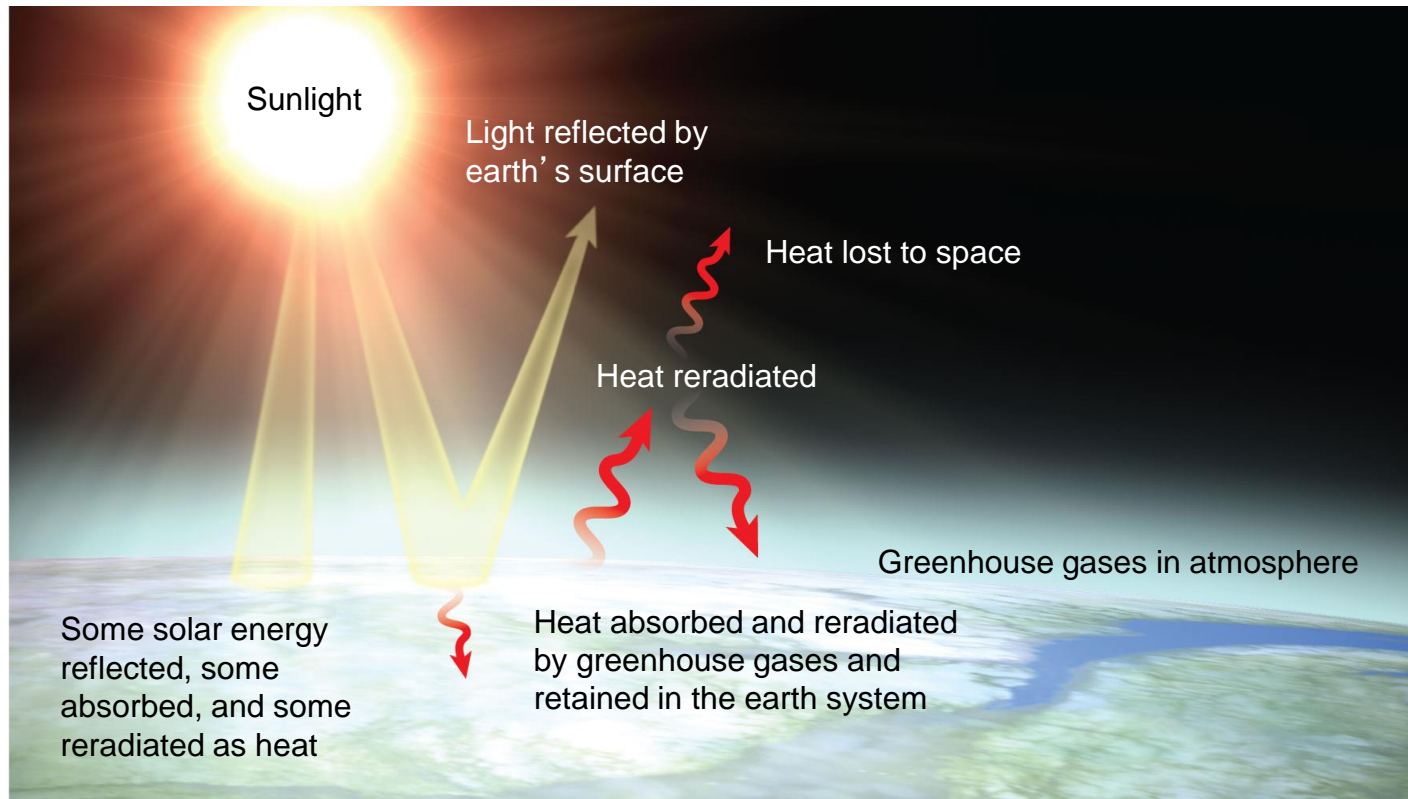


The Greenhouse Effect on Earth

The main force that shapes climate is solar energy that arrives as sunlight striking Earth's surface.

- Some of it is reflected into space while some is absorbed and converted to heat.

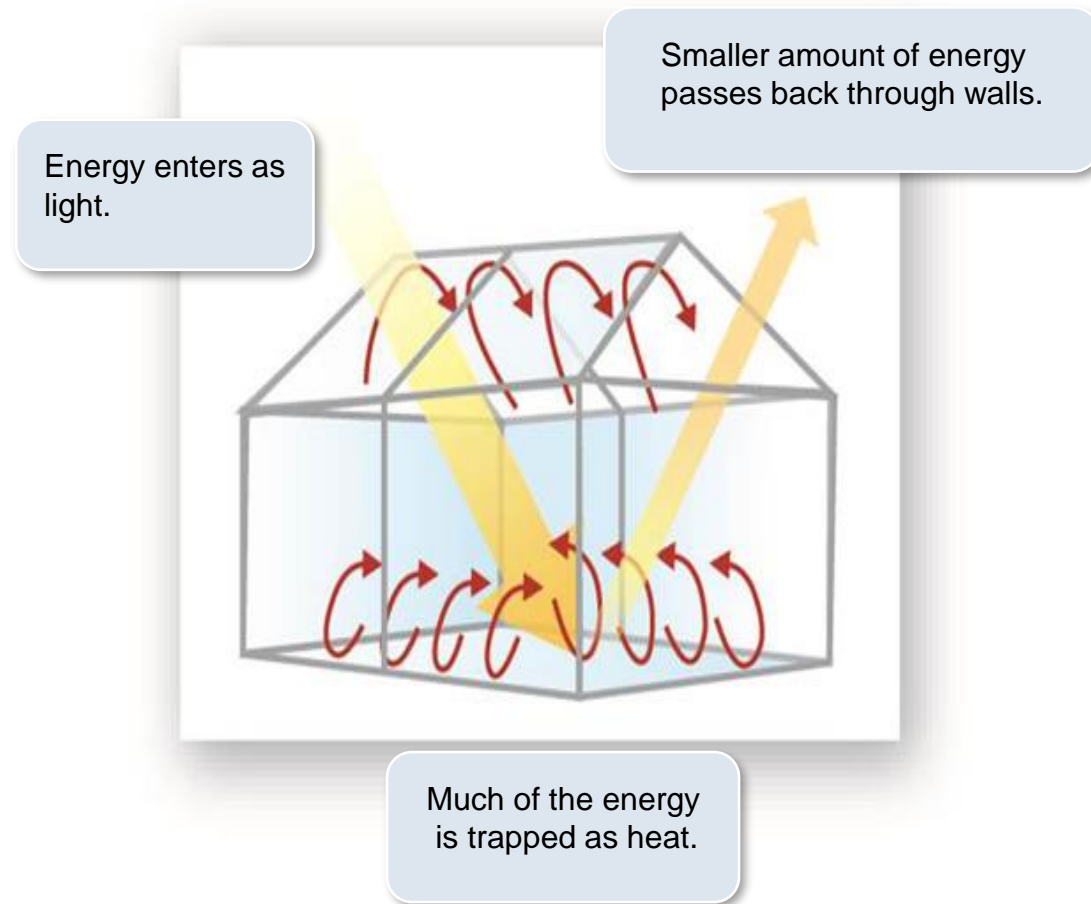
3 gases in the Earth's atmosphere: carbon dioxide, methane, and water vapor



Solar Energy and the Greenhouse Effect

Greenhouse effect: process in which certain gasses trap sunlight energy in Earth's atmosphere as heat

- Without this effect, Earth would be 30 °C cooler (86 °F)
- Nonhuman and human causes
 - Examples?
- If greenhouse concentration increases, Earth retains more heat and the Earth **warms!**
- If greenhouse concentration decreases, Earth loses more heat and the Earth **cools!**
- Natural cycle that has been going on since the beginning of time.



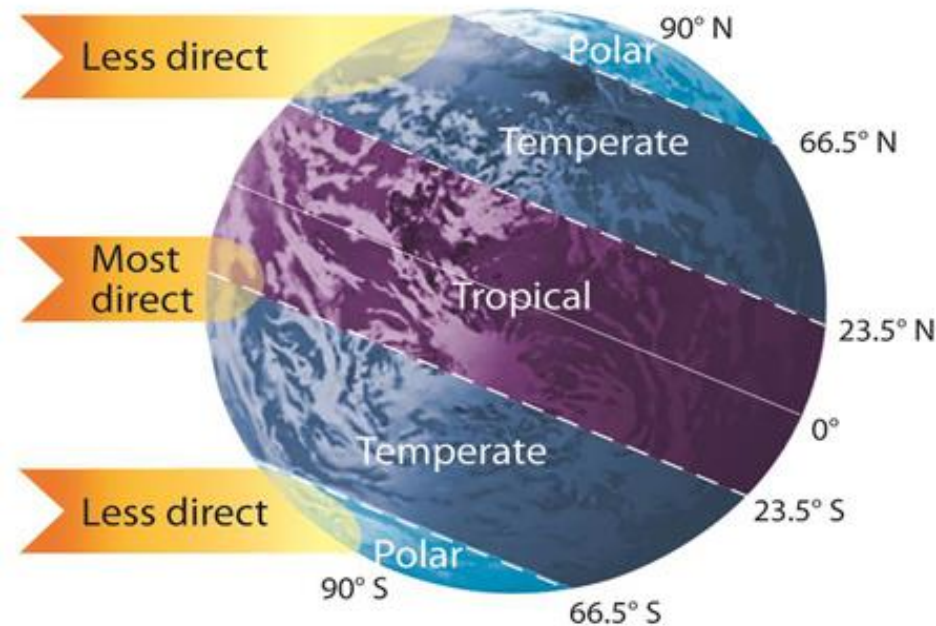
Latitude and Solar Energy

The Earth is curved and tilted on its axis therefore solar radiation strikes the surface at various angles and different times of the year.

- Equator = sun is directly overhead
- Poles = sun gets spread out
 - More heat arrives at the equator rather than the poles

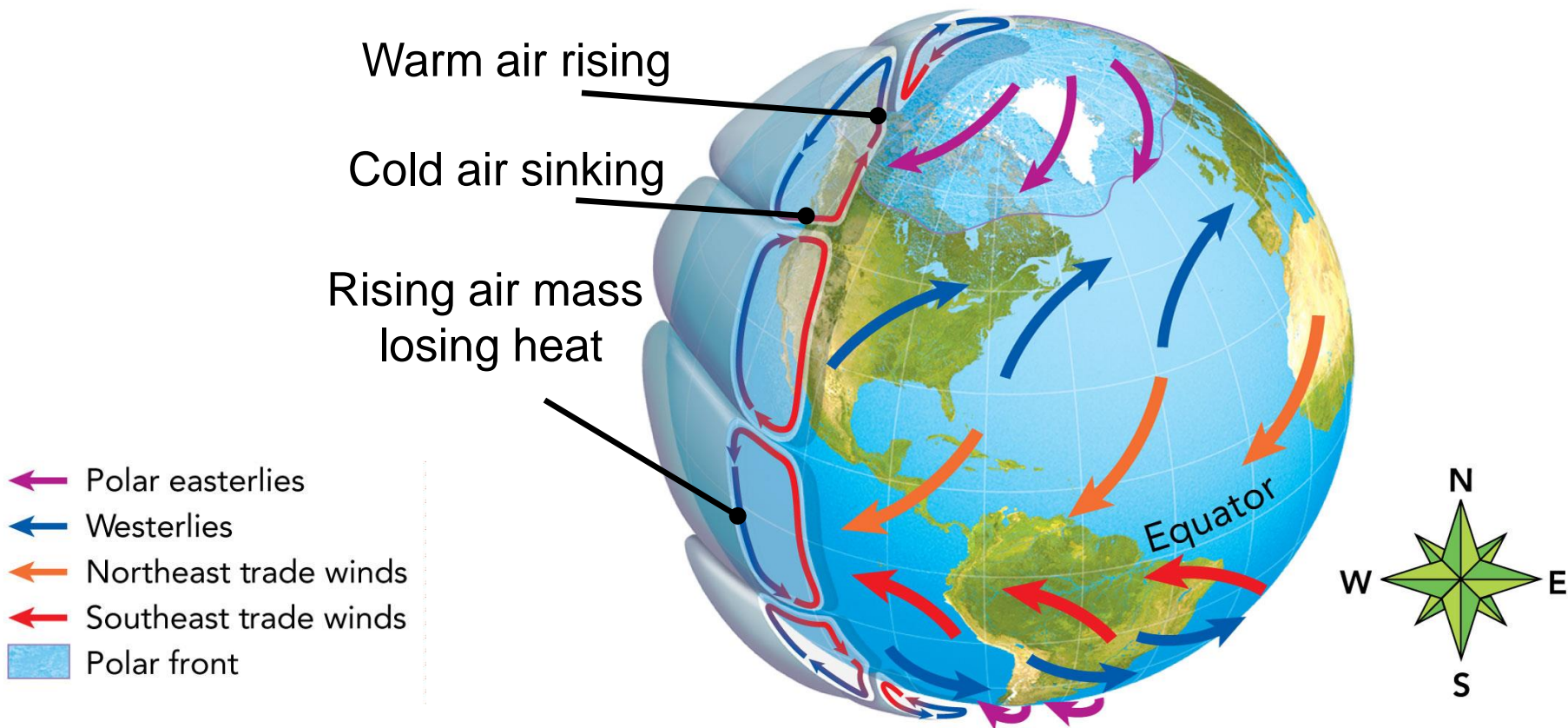
The difference in heat creates 3 regions:

- Polar – winters are bitterly cold and summers barely get warm
- Temperate – summers may be quite hot and winters can be very cold
- Tropical – temperatures are warm or hot all year



Global Winds

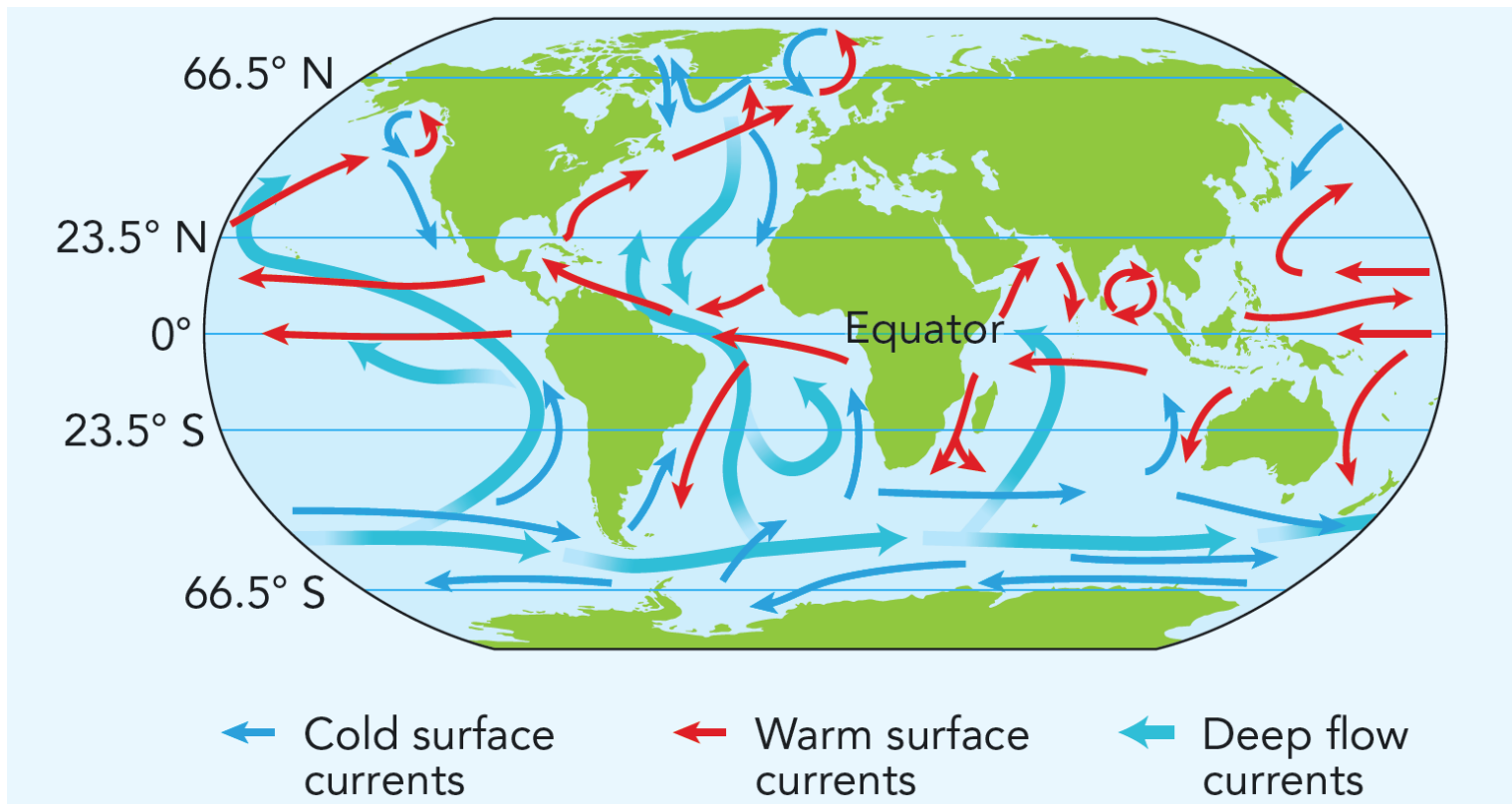
As air gets heated, it expands, becomes less dense, and rises.
Air spreads out and loses heat along the way.
As air cools, it sinks and becomes more dense.
This pattern of rising and cooling air creates wind.



Ocean Currents

Ocean currents flow around the world in the same manner as global winds but continents get in the way.

- Jupiter's Red Spot never hits a continent – it will get bigger. Ocean currents are driven and shaped by patterns of warming and cooling, by winds, and by the locations of continents.



Ocean Currents

The Gulf of Mexico brings up warm air that can fuel storms in North Dakota. That warm air carries more water content.

- This explains our Colorado Lows in the winter.

Polar air comes down from the north bringing drier air and bitterly cold temperatures.

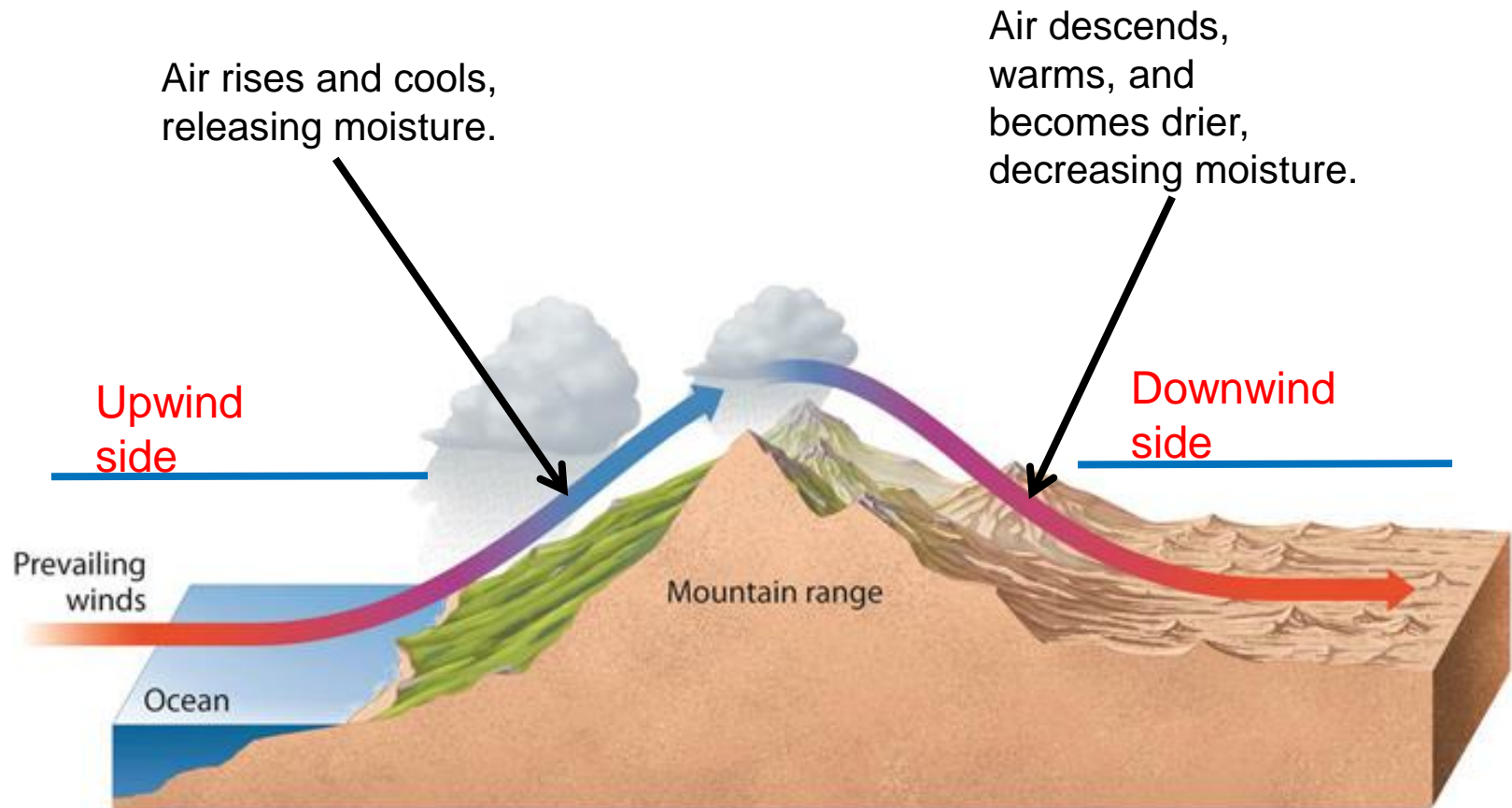
- This explains (there is more to it) the freezing temperatures in the winter and the cold spells in the summer.

Deep ocean currents play a role in our changes in weather patterns.

- Cold ocean water sinks and flows along the ocean floor.
- The bottom water rises to the surface – this is called upwelling
- Increases and decreases in the strength of the upwelling are part of a phenomenon called [El Nino and La Nina](#)

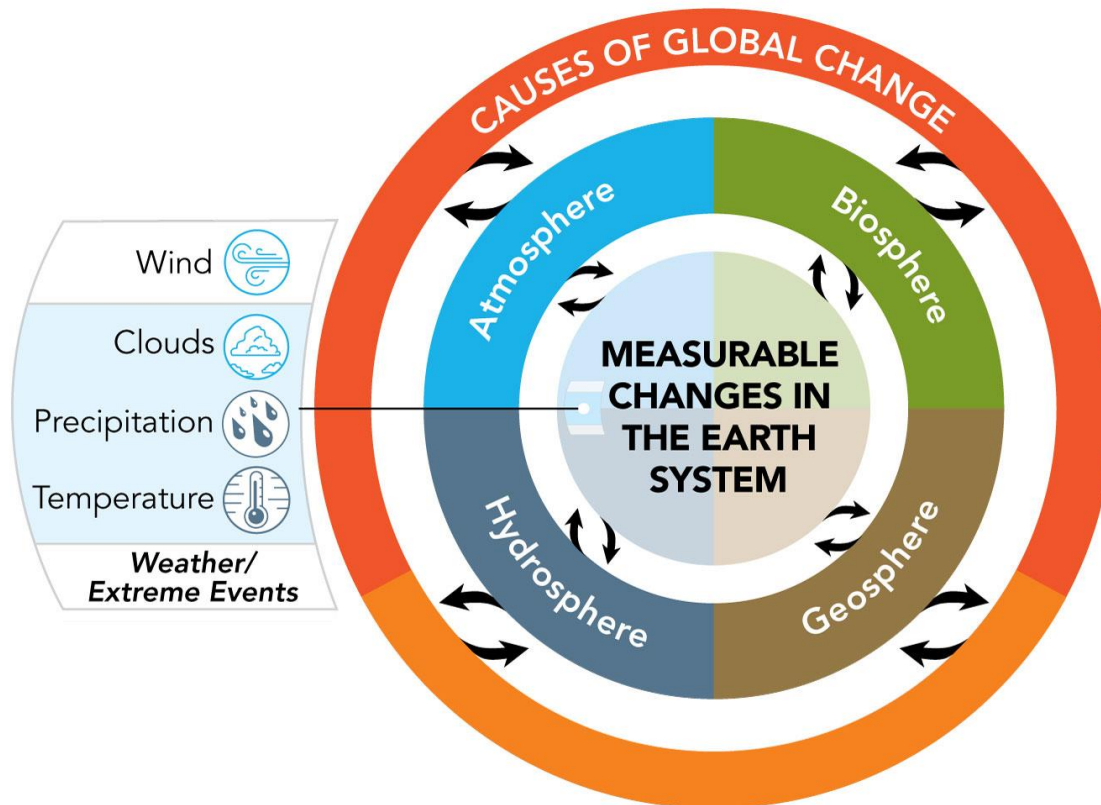
Regional Climate

Regional climates are shaped by latitude, by the transport of heat and moisture by winds and ocean currents, and by geographic features such as mountain ranges, large bodies of water, and ocean currents.



Changes in Climate

Climate change involves changes in temperature, clouds, winds, patterns and amounts of precipitation, and the frequency and severity of extreme weather events.



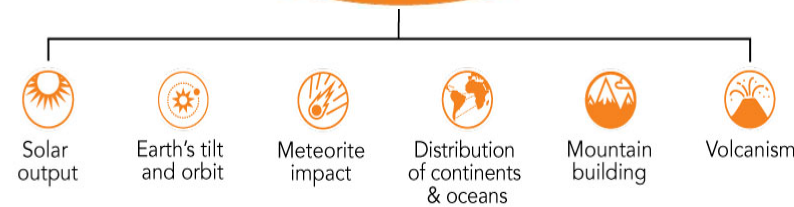
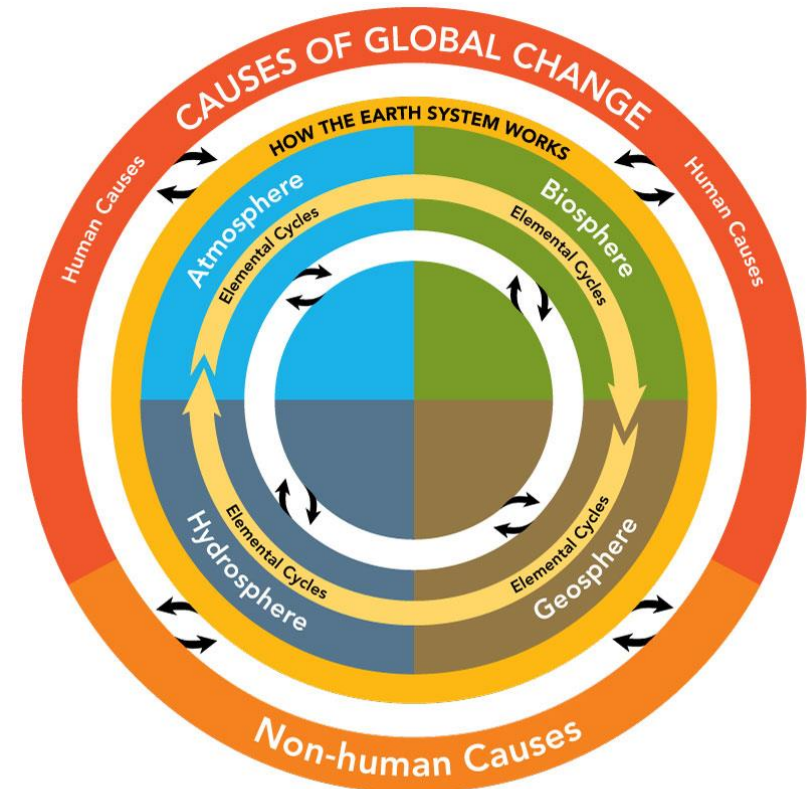
Nonhuman Causes of Climate Change

Not all factors that impact climate change are human caused.

- Changes in solar energy
- Variations in Earth's orbit
- Meteorite impacts
- Changes in the distributions of continents and oceans
- Mountain building – Pangaea
- Volcanic activity

[The last ice age was over 10,000 years ago.](#)

[Ice Ages video](#)



Adapted from *Understanding Global Change*, UC Berkeley