

# Today's Pre-test!

1. Climate on Earth is primarily determined by
  - A. the distance between the Earth and the Sun during a particular season.
  - B. the tilt of the Earth's axis as it rotates around the Sun.
  - C. the amount of cloud cover over a particular region of the Earth.
  - D. Ocean temperatures.
  - E. Earth's longitude.

# EARTH'S ATMOSPHERE – PART 2: EARTH'S CLIMATES

Mr. Whelton

September 23, 2014

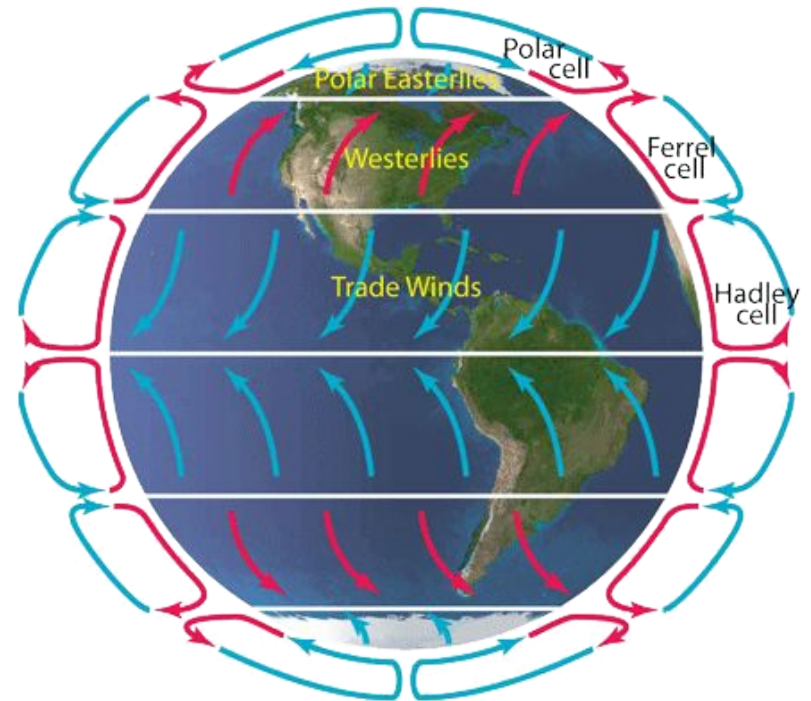
AP Environmental Science

# Today and Wednesday's topics

- How are weather and climate different?
- Why are there different climates on the Earth?
- What factors affect air circulating on the Earth?
  
- How does Earth's atmosphere create conditions conducive to life on Earth?

# Convection and the Wind

- Remember, heating air → less pressure and density → rising air AKA convection
- Wind = movement of air caused by changes in air pressure
- Warm, moist air rises and then cools, then the cool, dry air sinks



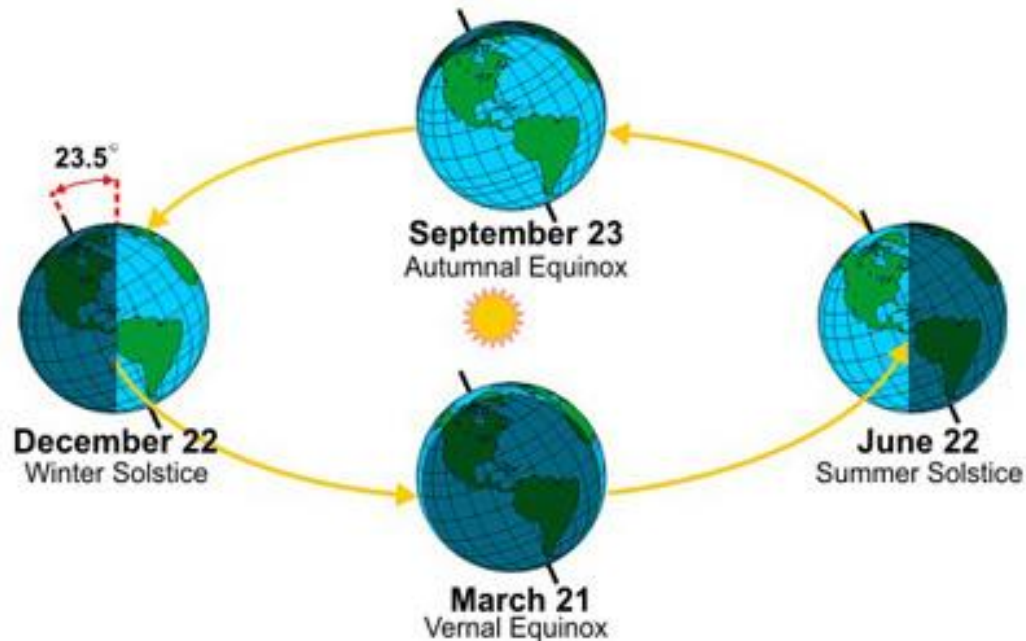
# Weather v. Climate

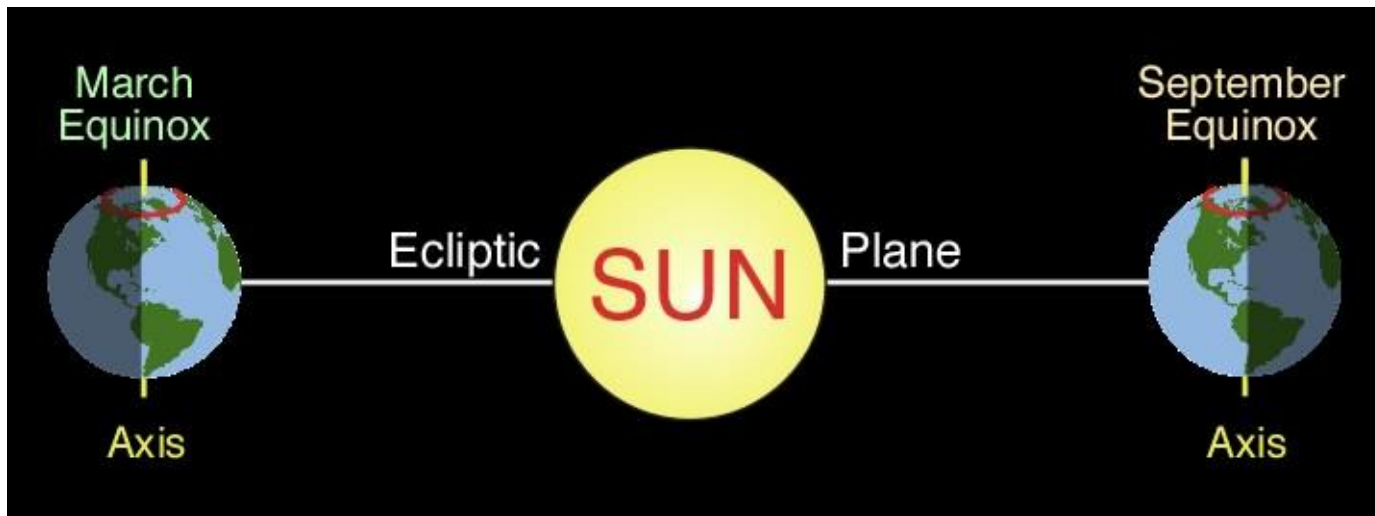
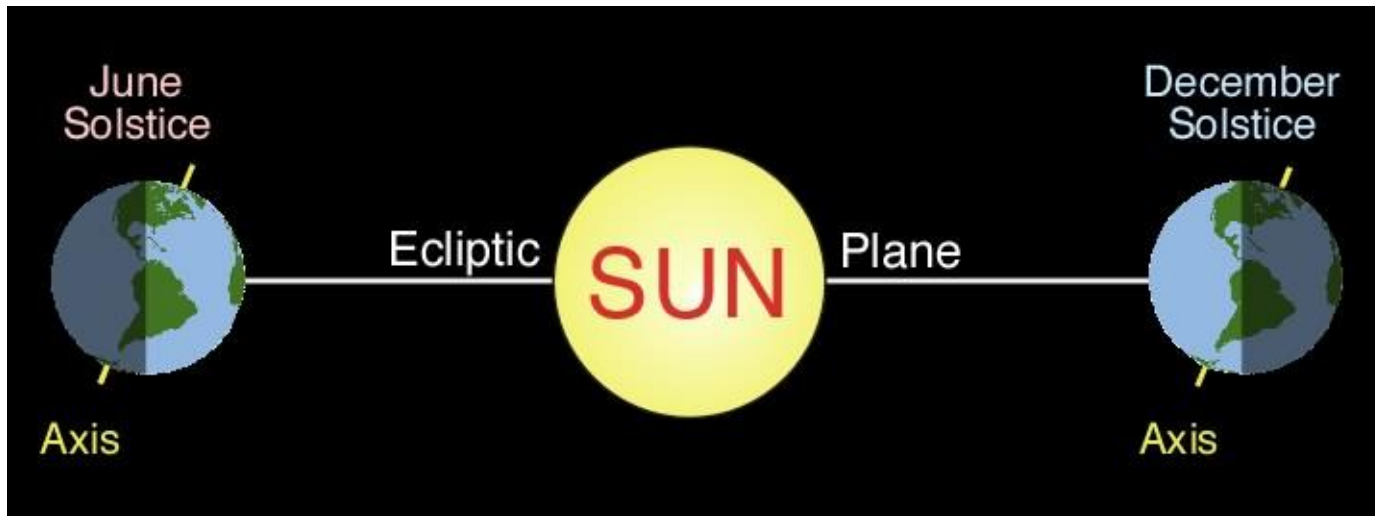
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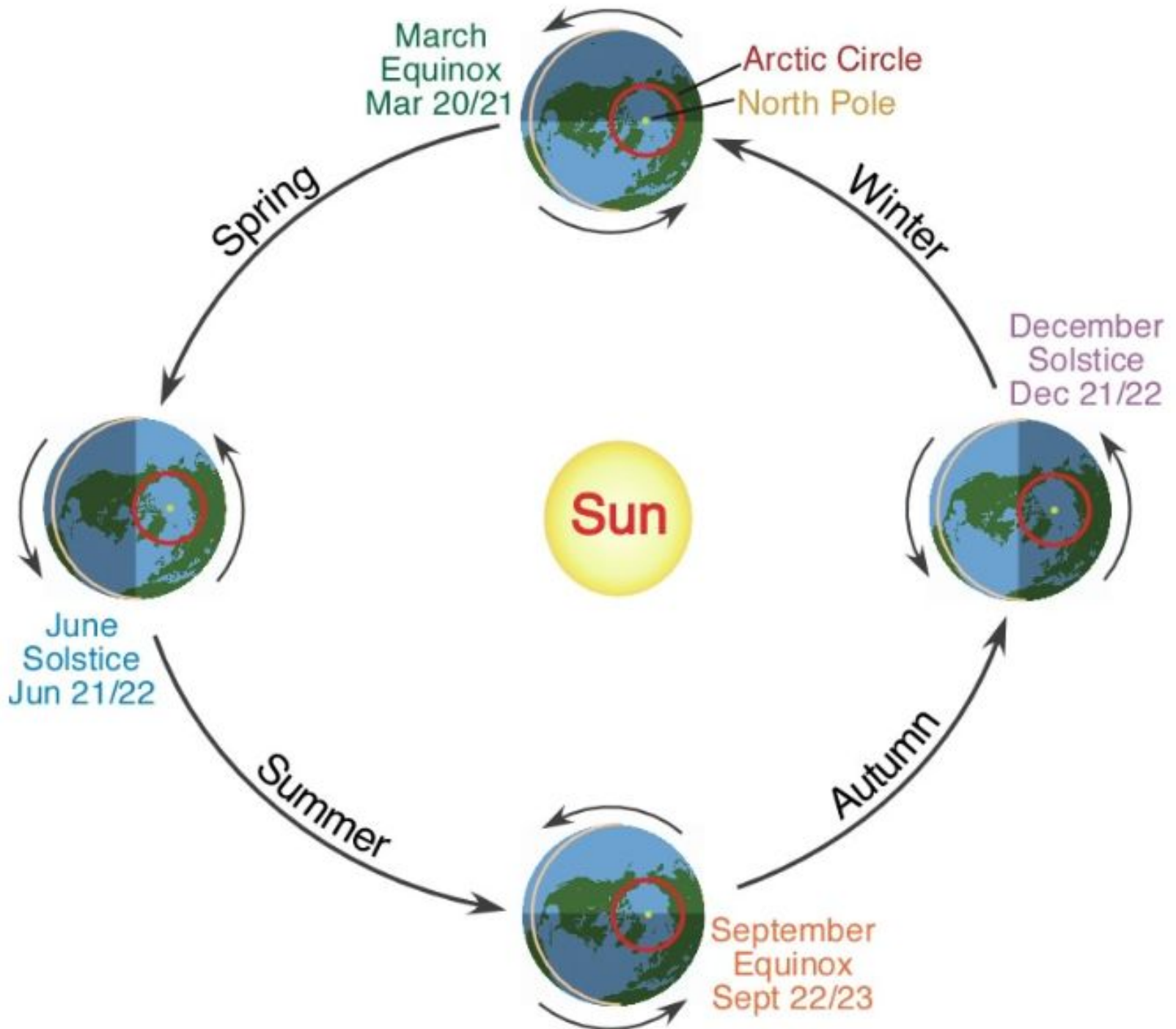
- Weather
- Climate
- “Climate is what we expect, weather is what we get.” – Mark Twain

# Why Are There Different Climates on Earth?

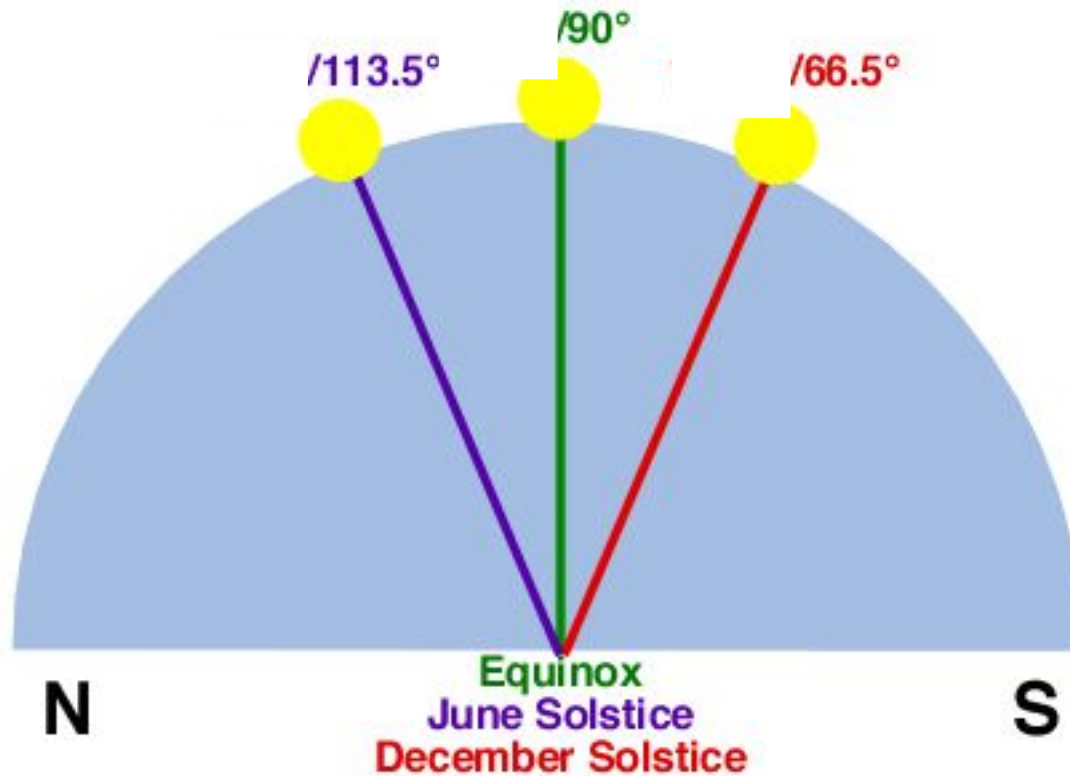
- 1. The Sun does not evenly heat the Earth
  - Why not?
    - The tilt of the Earth → some areas getting more direct sunlight



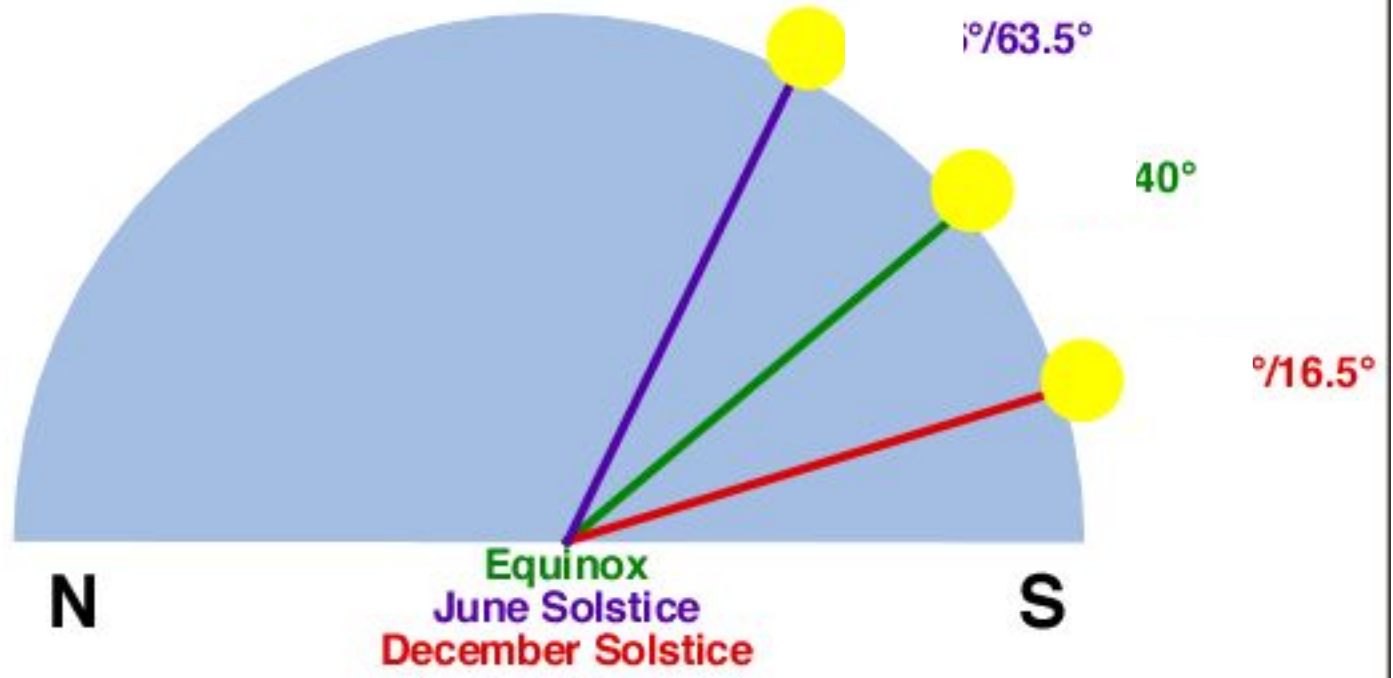








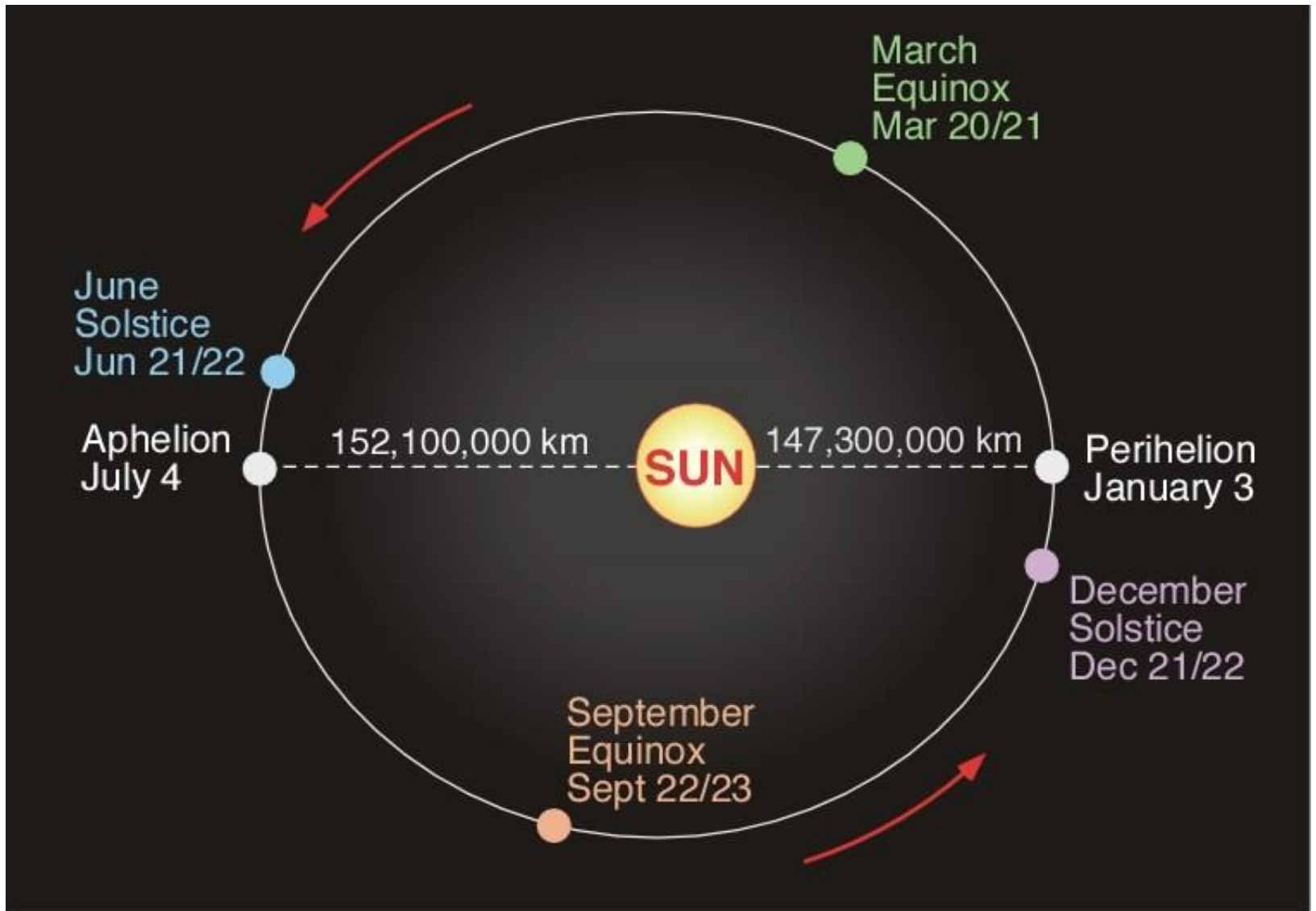
The elevation of the Sun at different points of the year from the equator (facing south)

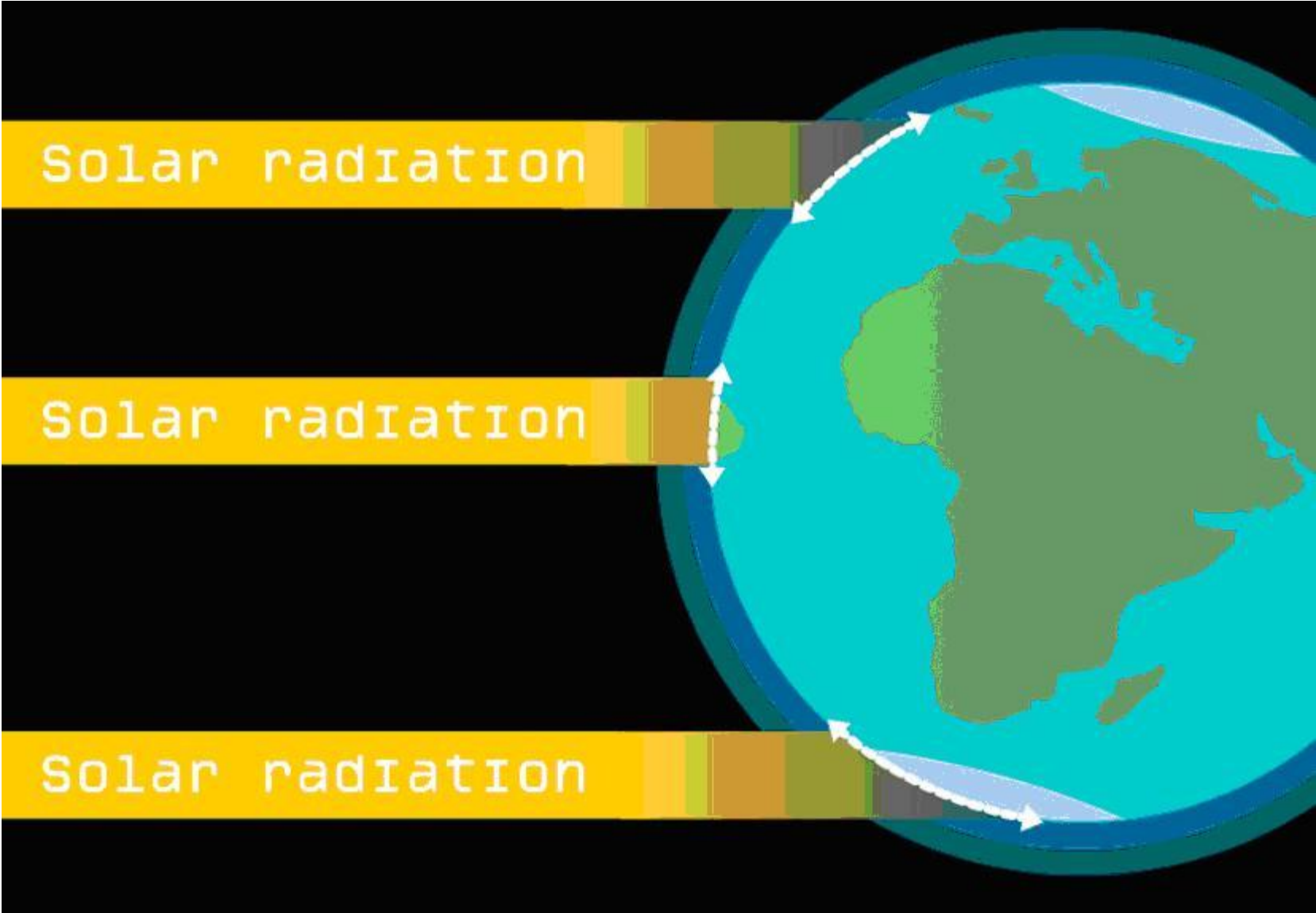


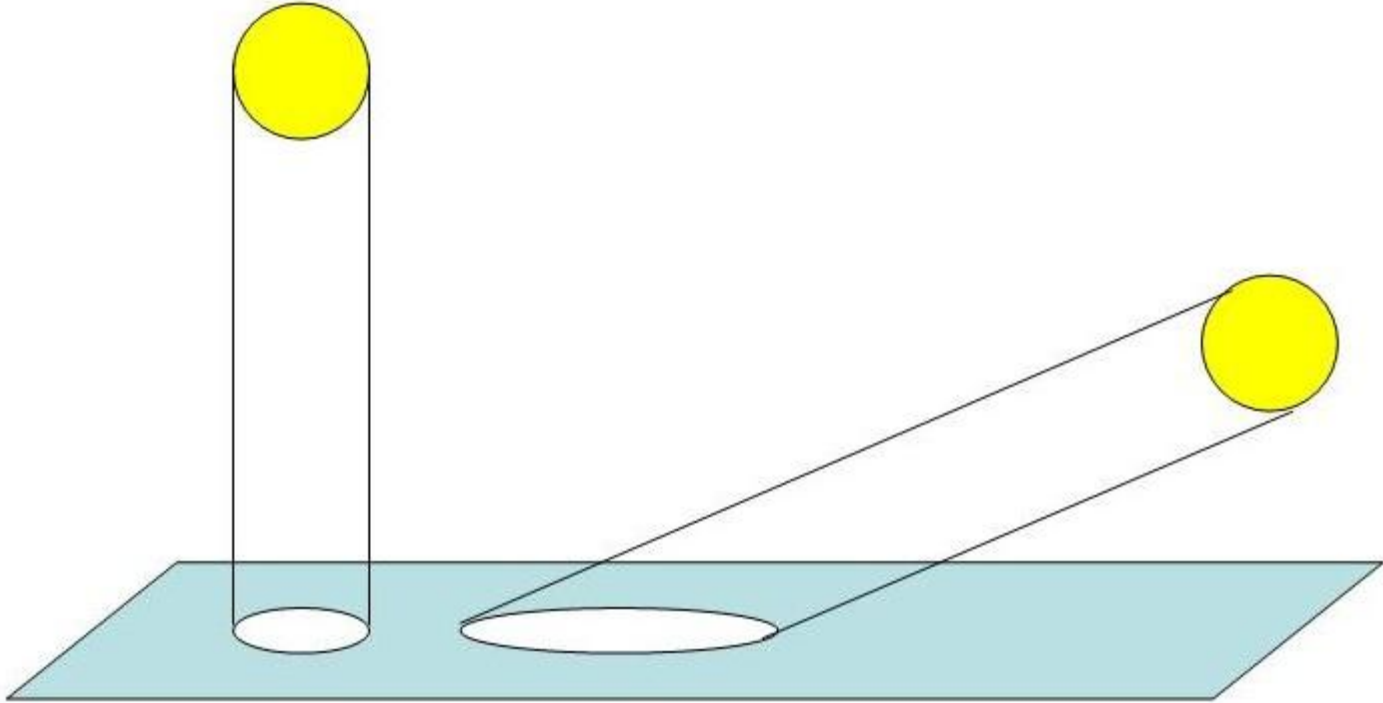
The elevation of the Sun at different points of the year from the  $50^\circ\text{N}$  (facing south)

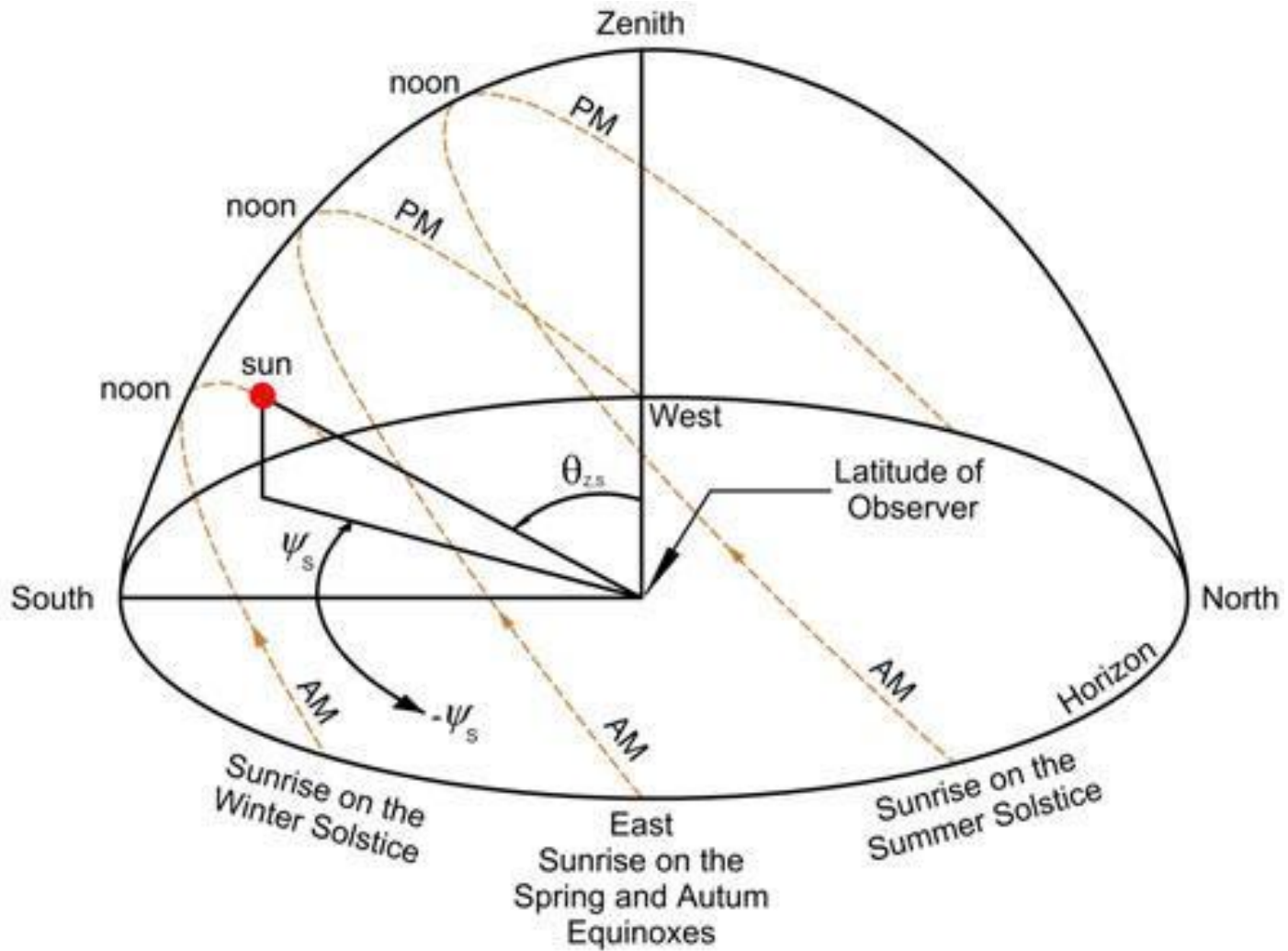
# Our trajectory

- Requirements for life
  - Liquid solvent – water!
  - Protection from UV light
  - Source of energy
  - Complex chemistry









# Why Are There Different Climates on Earth?

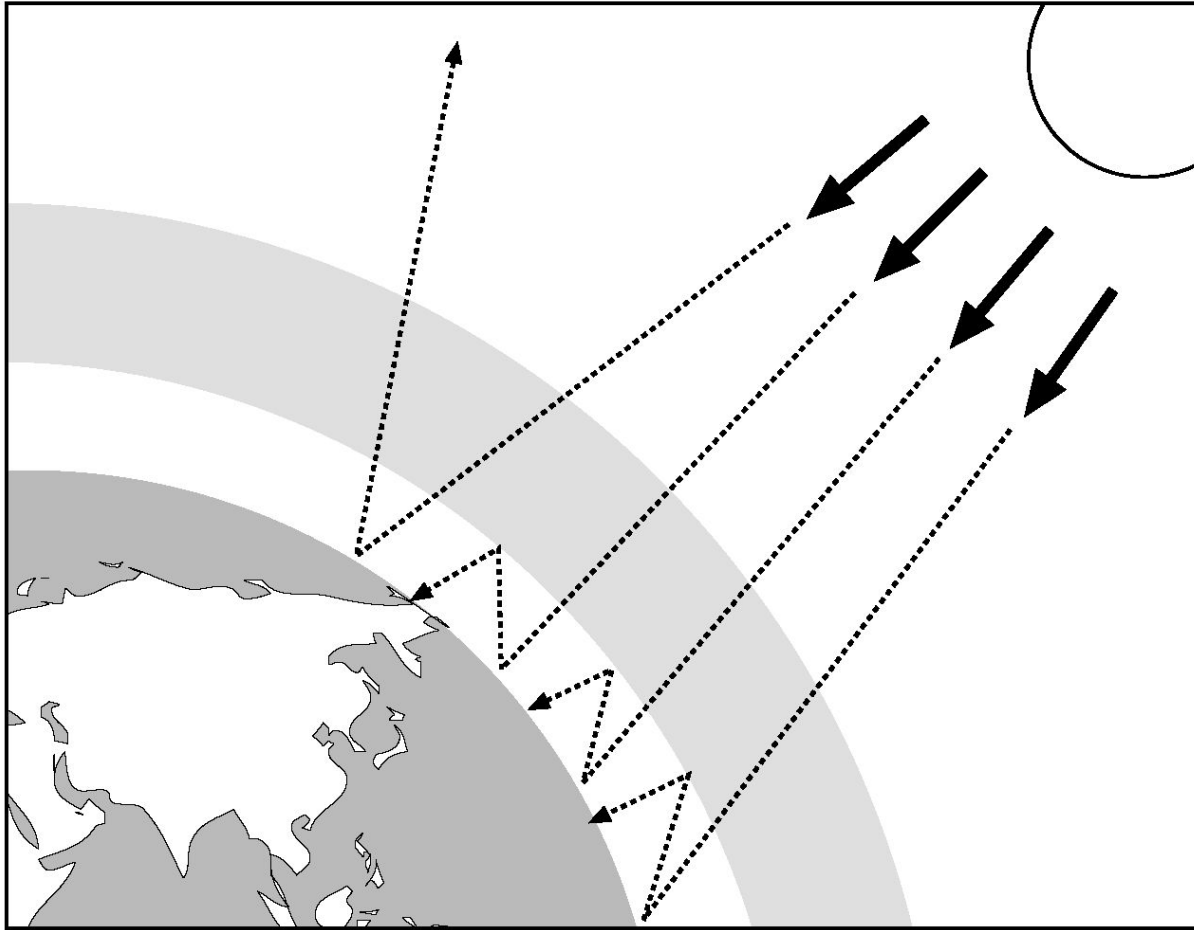
- 2. The reflectivity of different surfaces – aka **albedo**
  - Oceans have low albedo and absorb lots of solar radiation
  - Snow, ice, and dust have high albedos and reflect away lots of incoming radiation
    - How could a change to the amount of ice and snow on Earth affect global temperatures/climates?



# The Greenhouse Effect

- Certain gases in the atmosphere act like a blanket and trap heat
  - Ex. Carbon dioxide ( $\text{CO}_2$ ), methane ( $\text{CH}_4$ ), and water vapor ( $\text{H}_2\text{O}$ )
- In itself, the Greenhouse Effect is NOT harmful
  - Without it, life would not be possible
  - But too much *could* be a bad thing
- But what about human actions?

# Greenhouse Effect illustrated



# Why Are There Different Climates on Earth?

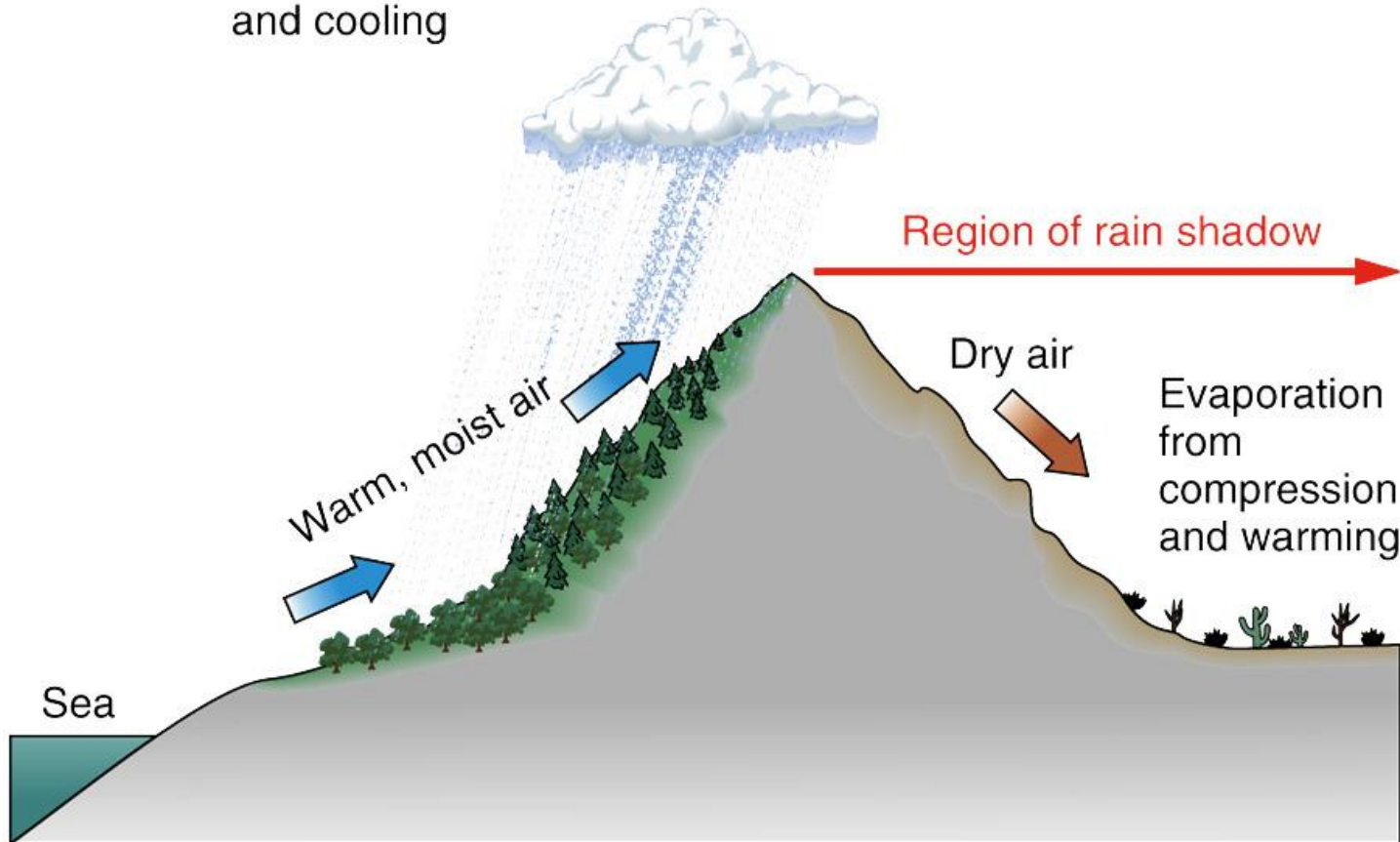
- 3. The properties of air, land, water in an area affect climate
  - Ex. Mountains can cool air drastically
  - Shorelines/oceans can cause temperature differences
- Heat from the Sun evaporates ocean water and transfers heat from the oceans to the atmosphere

|           | Dallas Average Monthly Temp. High (F) | San Diego Average Monthly Temp. High (F) | Dallas Average Monthly Temp. Low (F) | San Diego Average Monthly Temp. Low (F) |
|-----------|---------------------------------------|--|--------------------------------------|---|
| January   | 57                                    | 65                                       | 37                                   | 49                                      |
| February  | 61                                    | 65                                       | 41                                   | 51                                      |
| March     | 69                                    | 66                                       | 49                                   | 53                                      |
| April     | 77                                    | 68                                       | 56                                   | 56                                      |
| May       | 84                                    | 69                                       | 65                                   | 59                                      |
| June      | 92                                    | 71                                       | 73                                   | 62                                      |
| July      | 96                                    | 75                                       | 77                                   | 65                                      |
| August    | 96                                    | 76                                       | 77                                   | 67                                      |
| September | 89                                    | 76                                       | 69                                   | 65                                      |
| October   | 79                                    | 73                                       | 58                                   | 61                                      |
| November  | 67                                    | 69                                       | 48                                   | 54                                      |
| December  | 58                                    | 65                                       | 39                                   | 48                                      |
| Year      | 77                                    | 70                                       | 57                                   | 58                                      |

# Rain Shadow Effect

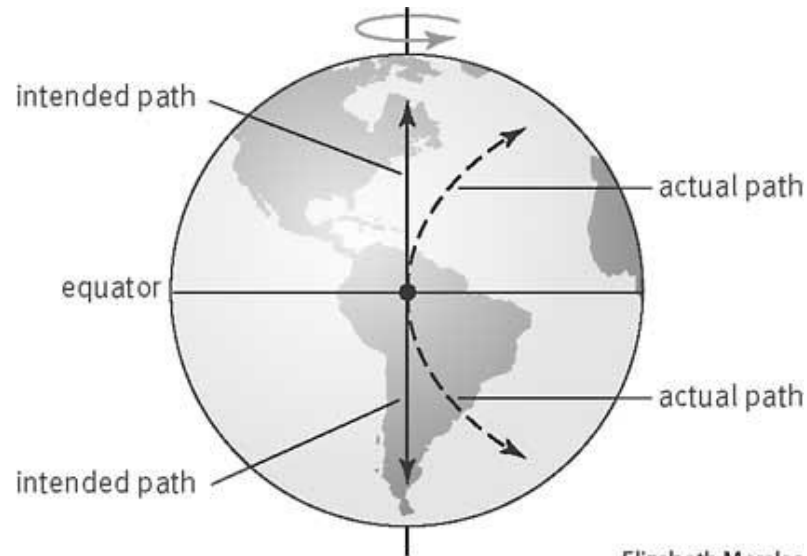
PM 13.04

Rain from expansion  
and cooling



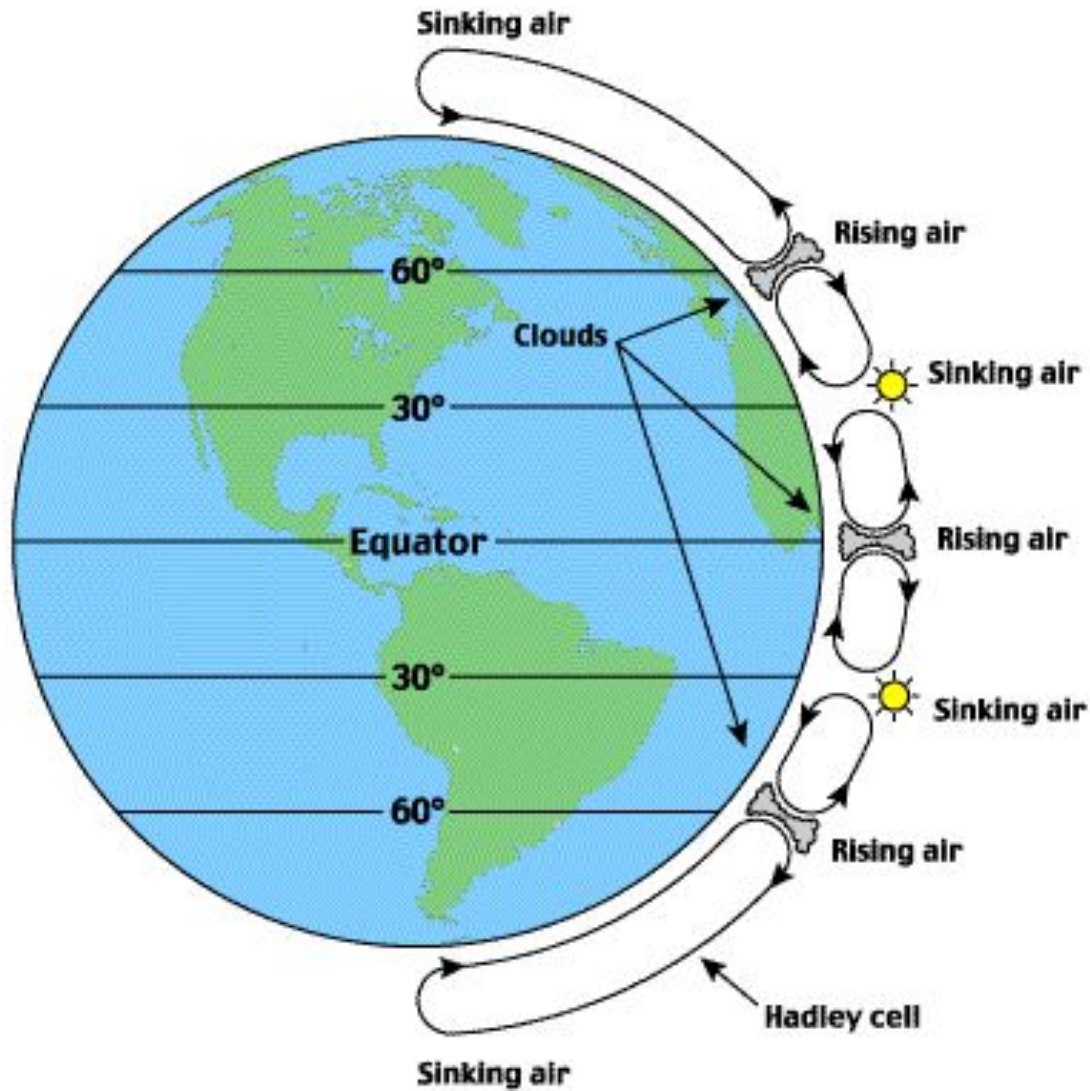
# Why Are There Different Climates on Earth?

- 4. The rotation of the Earth on its axis
  - Wind/air masses that are moving along the surface are deflected
    - Northern hemisphere – deflected to the right
    - Southern hemisphere – deflected to the left



Elizabeth Morales

# Global air circulation



# Demonstrating understanding

- Revisit your Atmosphere and Climate Reflection and complete **Part 4**.
- **Why do different regions of the Earth have different climates?**



# Global Wind Patterns

