

**MYP Biology**  
**An Introduction to  
Ecology and the Biosphere**



# Ecology/Biosphere

I.

Main Idea: Climate influences distribution of organisms

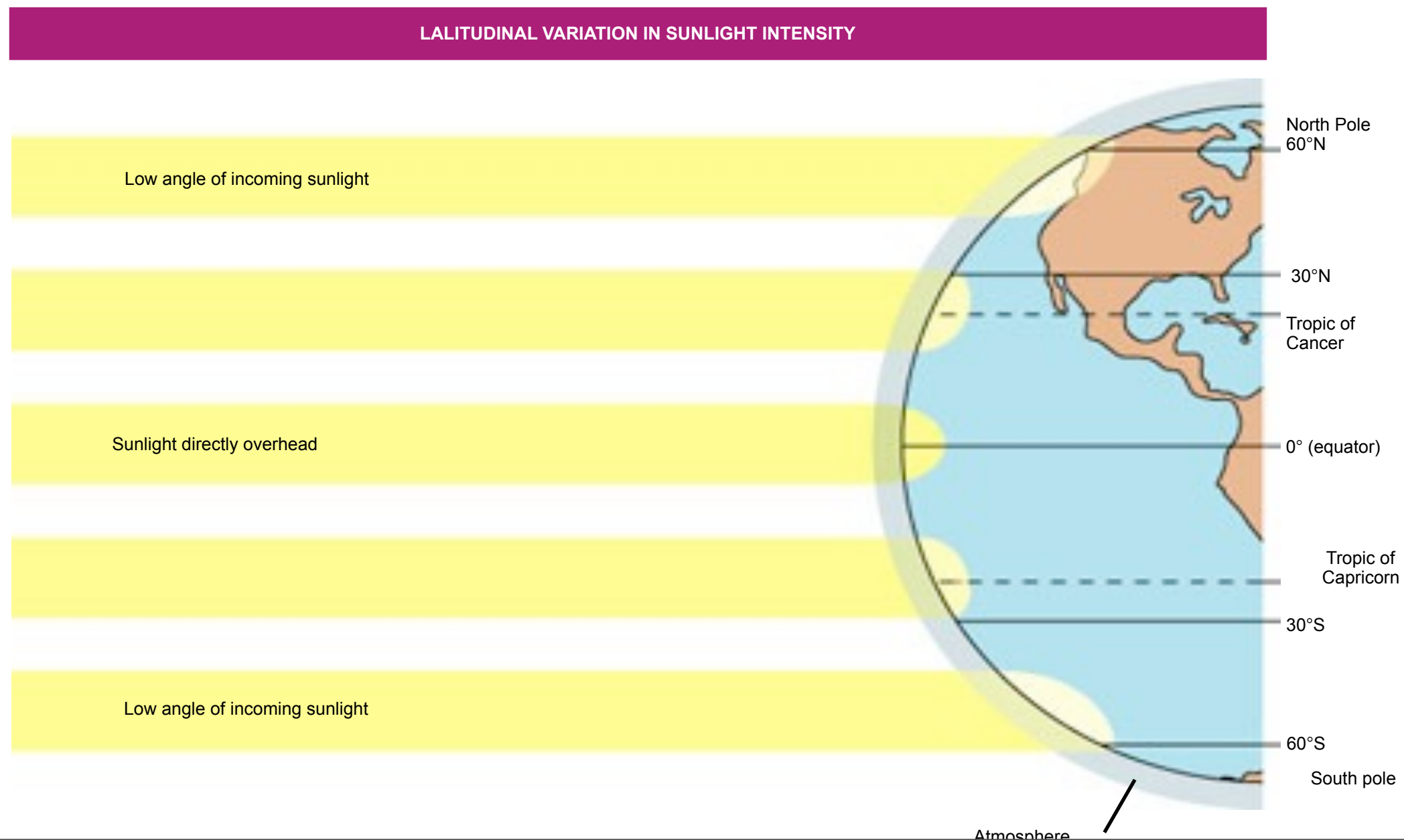
Main Idea: Climate Varies by latitude

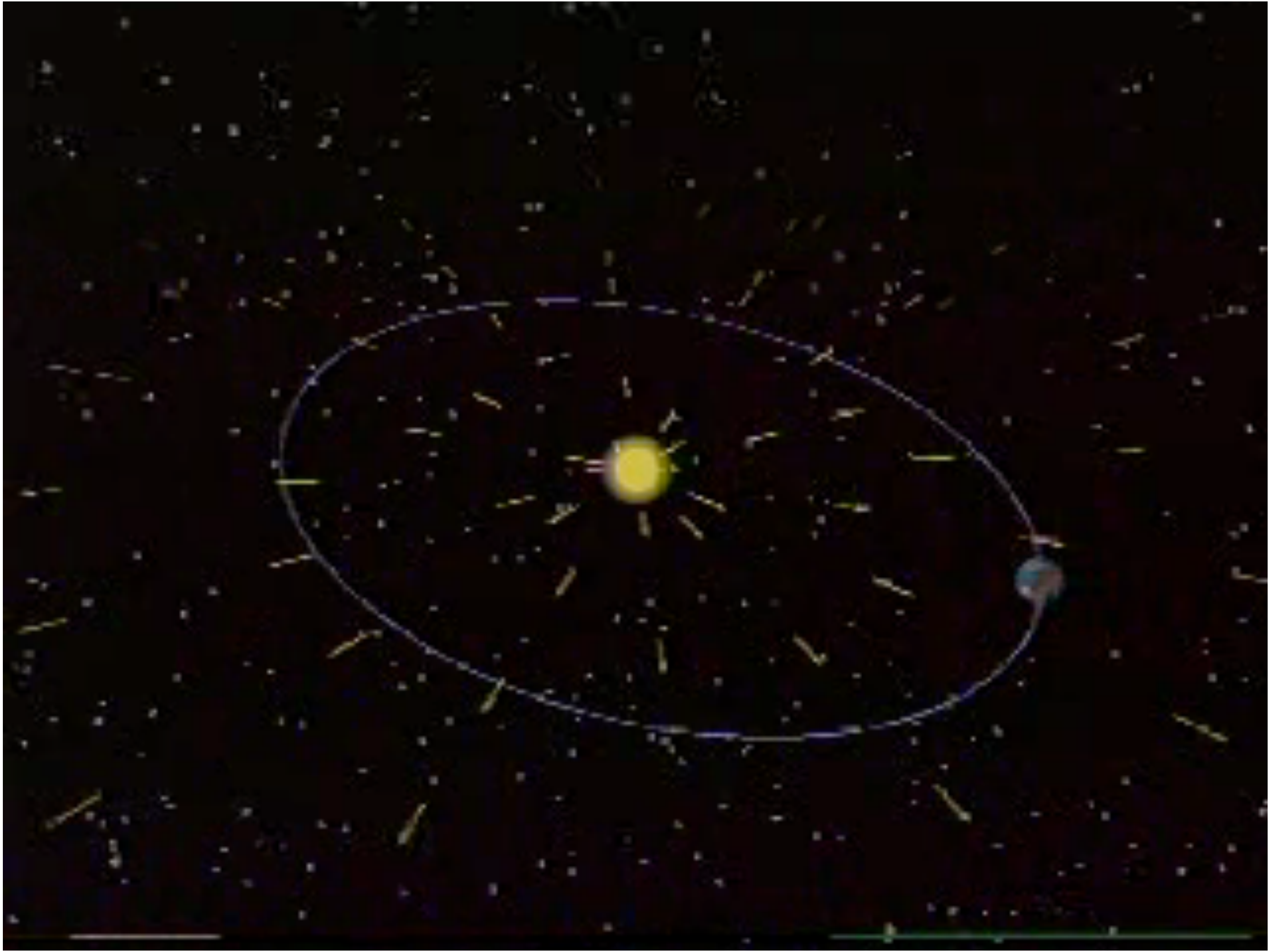
Can you give any examples of organisms distributed by latitude?

# CLIMATE VARIATION & CHANGE

## A. Latitude and Sunlight

- intensity of sunlight decreases as you move from equator to the poles





# A. Latitude and Sunlight

- intensity of sunlight decreases as you move from equator to the poles

Equator (a)

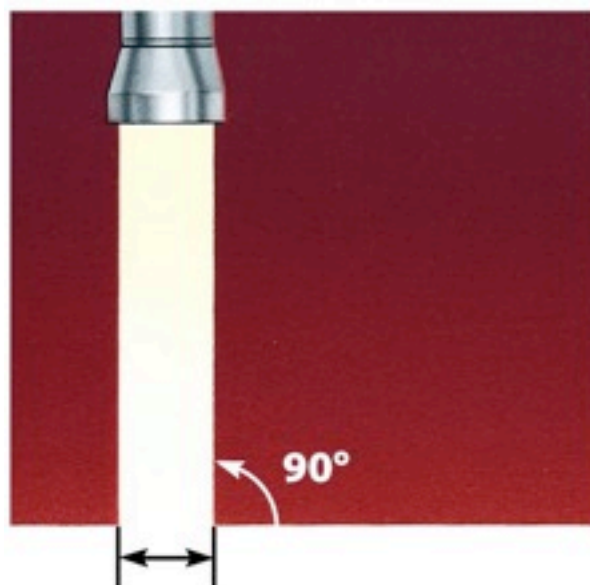
High concentration  
Little Reflection High  
Temperature

From (a) to (c)

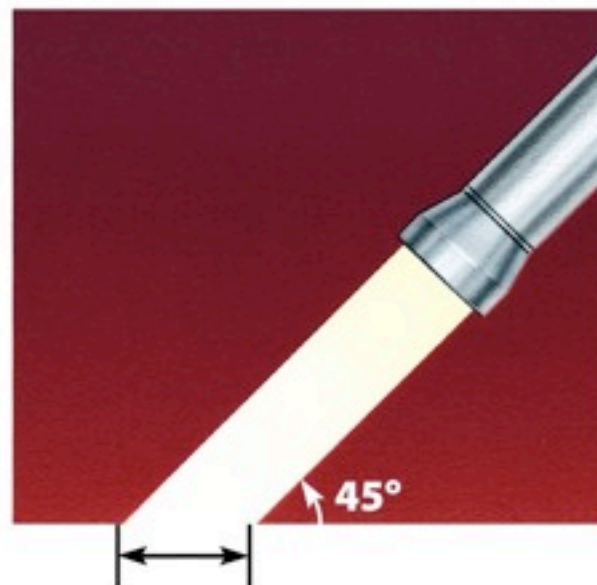
In diagram below

Closer to Poles (c)

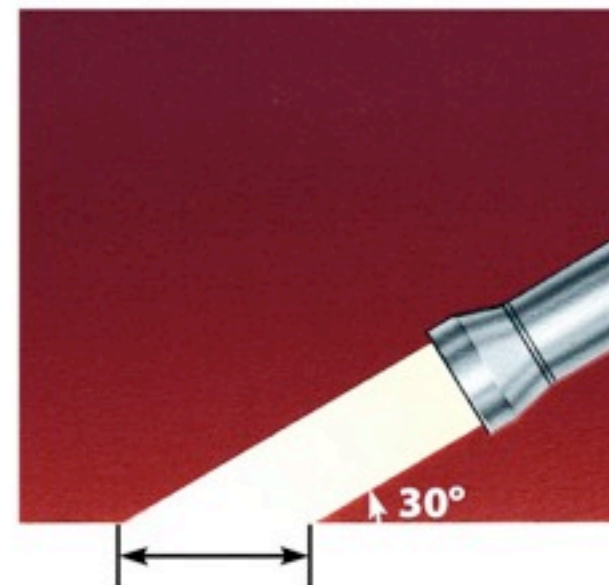
Low concentration  
Higher Reflection  
Low Temperature



1 unit of surface area  
(a) One unit of light is concentrated over one unit of surface area.

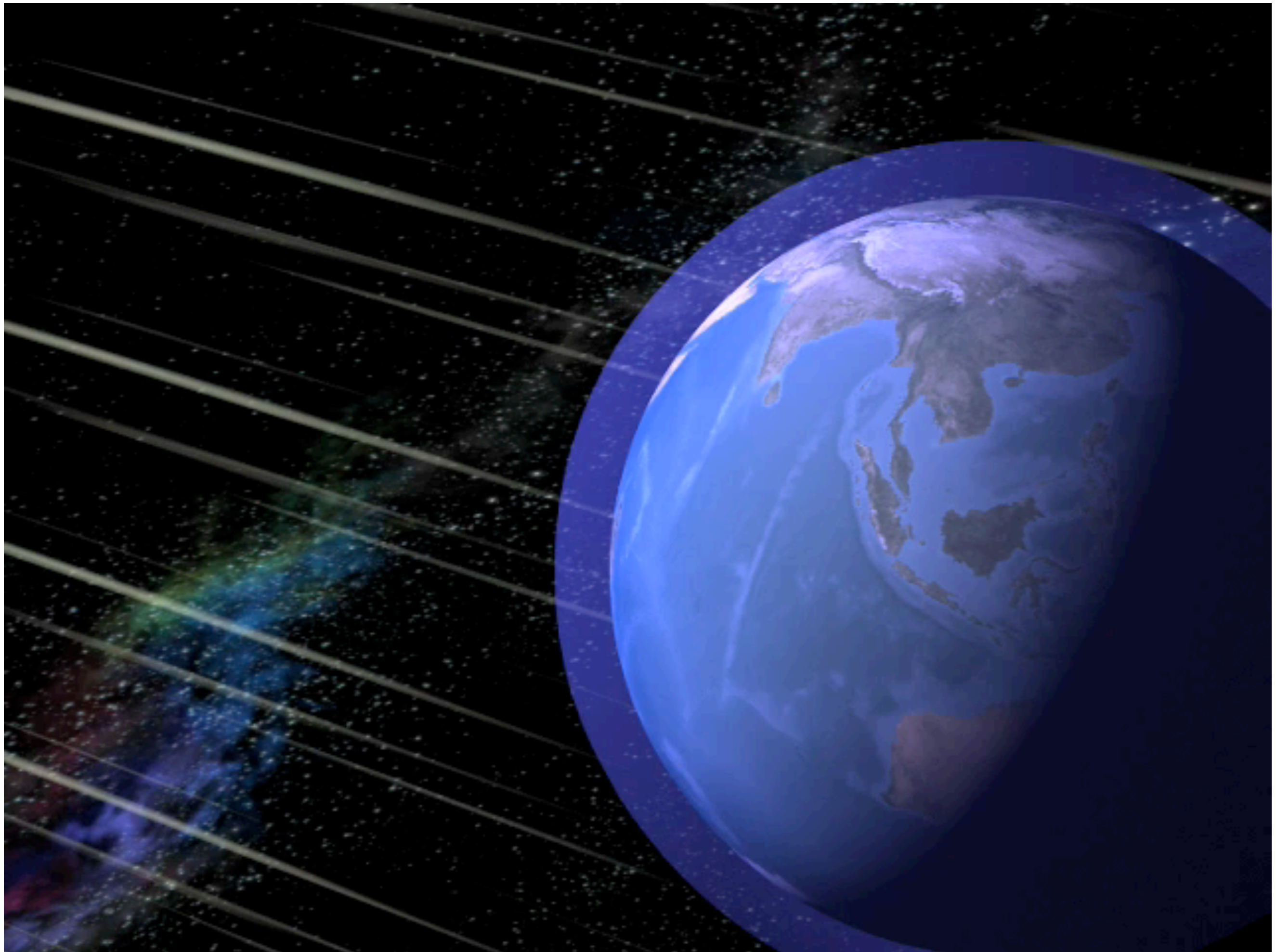


1.4 units of surface area  
(b) One unit of light is dispersed over 1.4 units of surface area.



2 units of surface area  
(c) One unit of light is dispersed over 2 units of surface area.

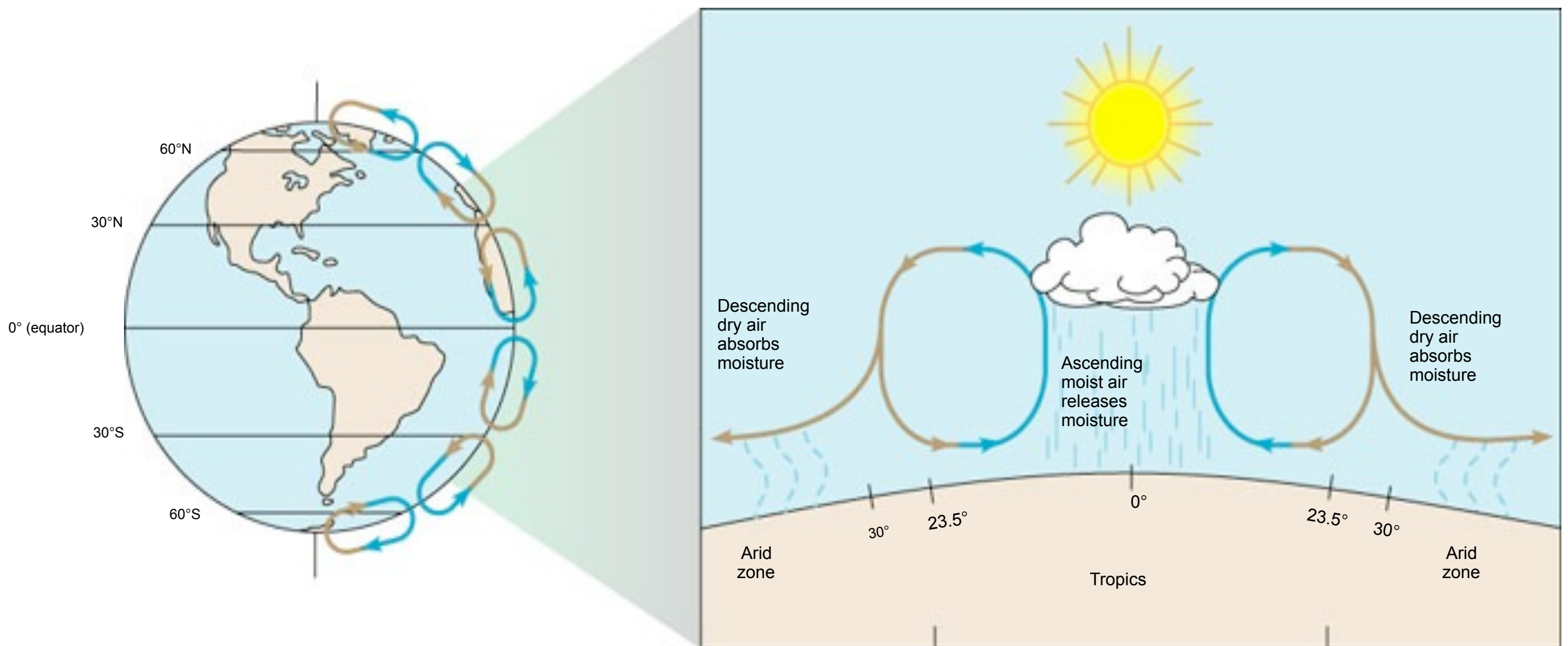




# B. Global Wind & Rain

- hot air rises and cool air falls
- dry air absorbs water (higher rate of evaporation)

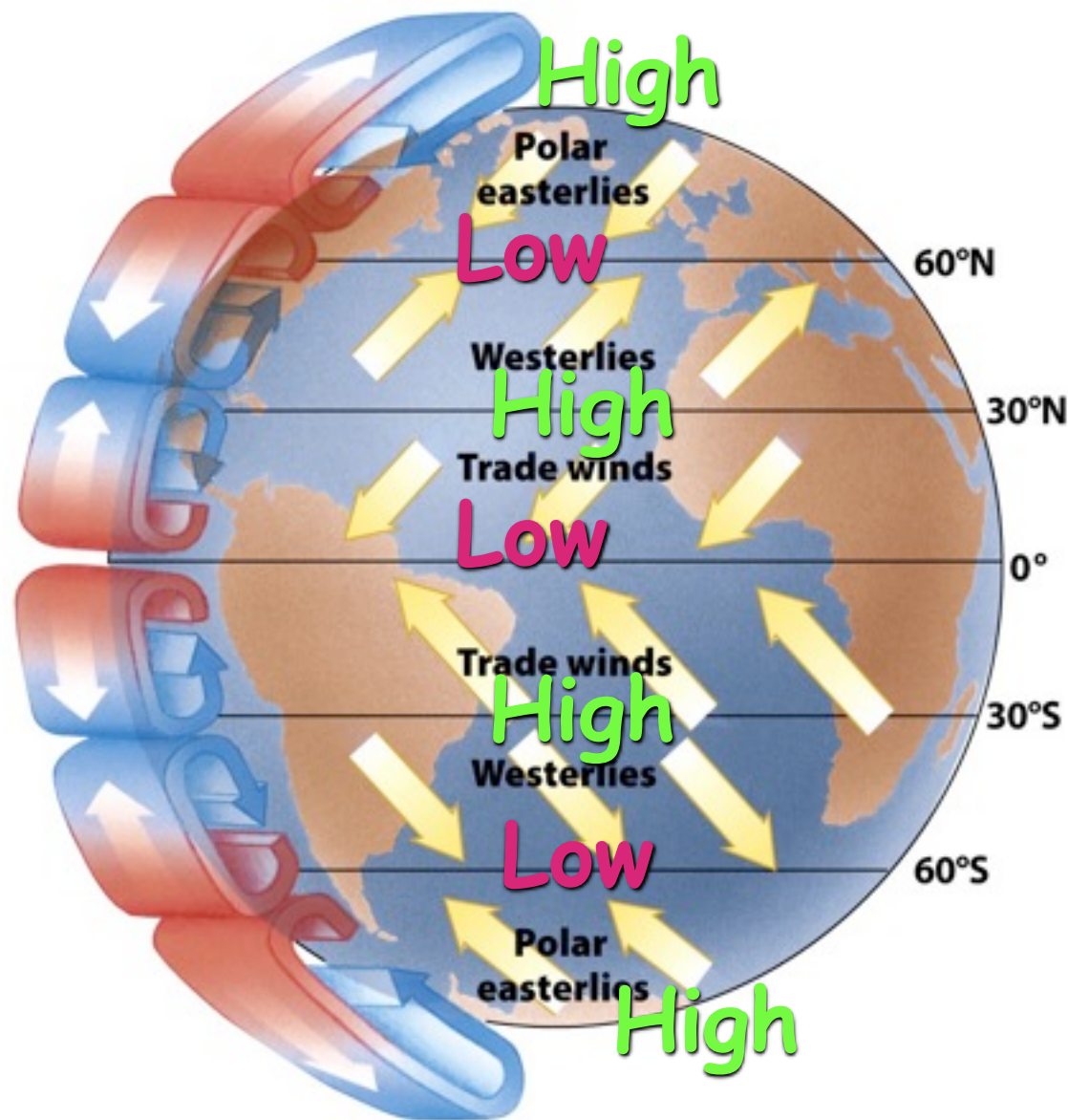
## GLOBAL AIR CIRCULATION AND PRECIPITATION PATTERNS



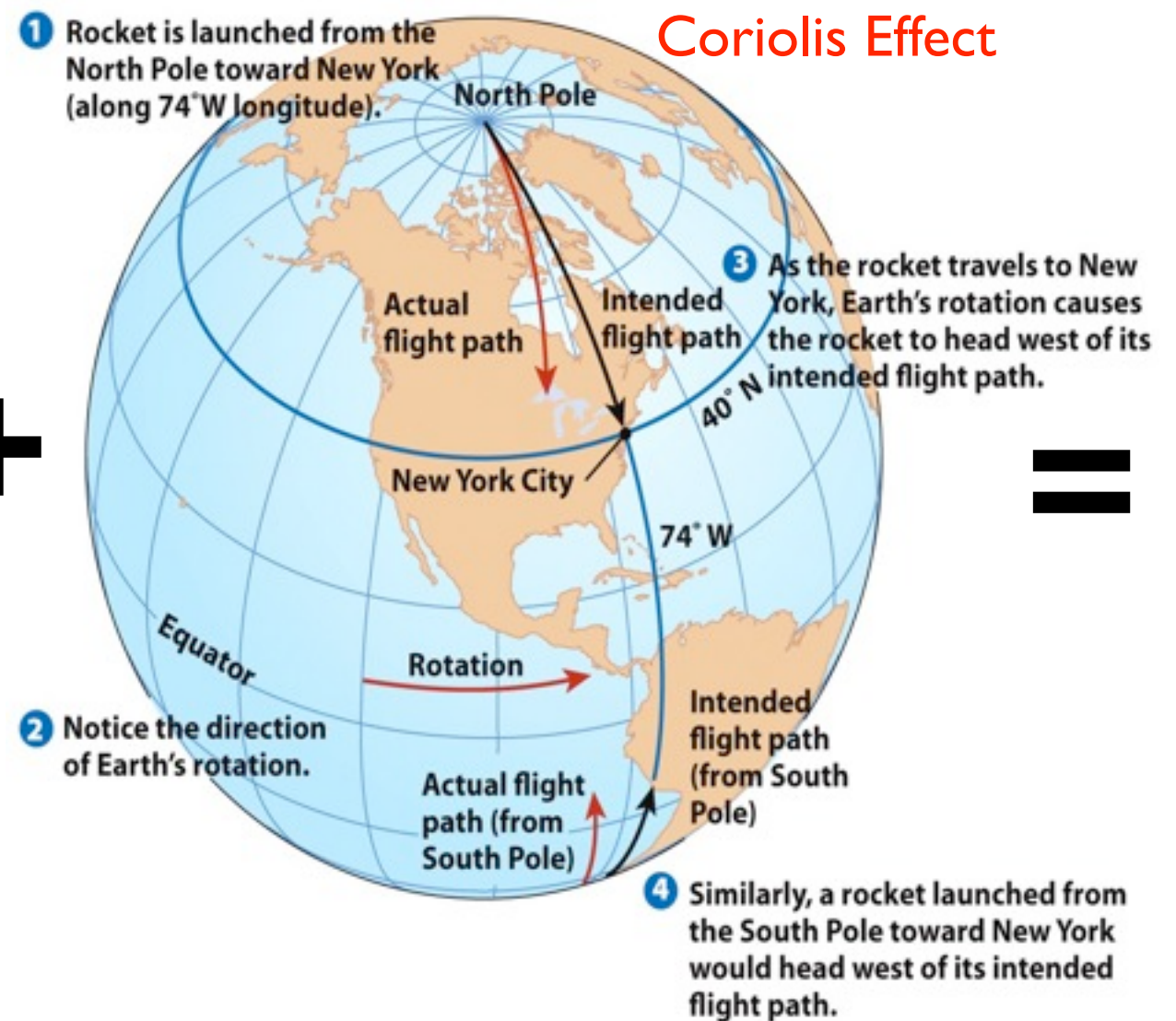


# B. Global Wind & Rain Patterns

- hot air rises and cool air falls
- dry air absorbs water (higher rate of evaporation)



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## B. Global Wind & Rain Patterns

- the rotating earth + the rising and falling air = pattern seen below
- (note: the land at the equator is moving faster than the land at the poles causing a deflection in the air)

### GLOBAL WIND PATTERNS

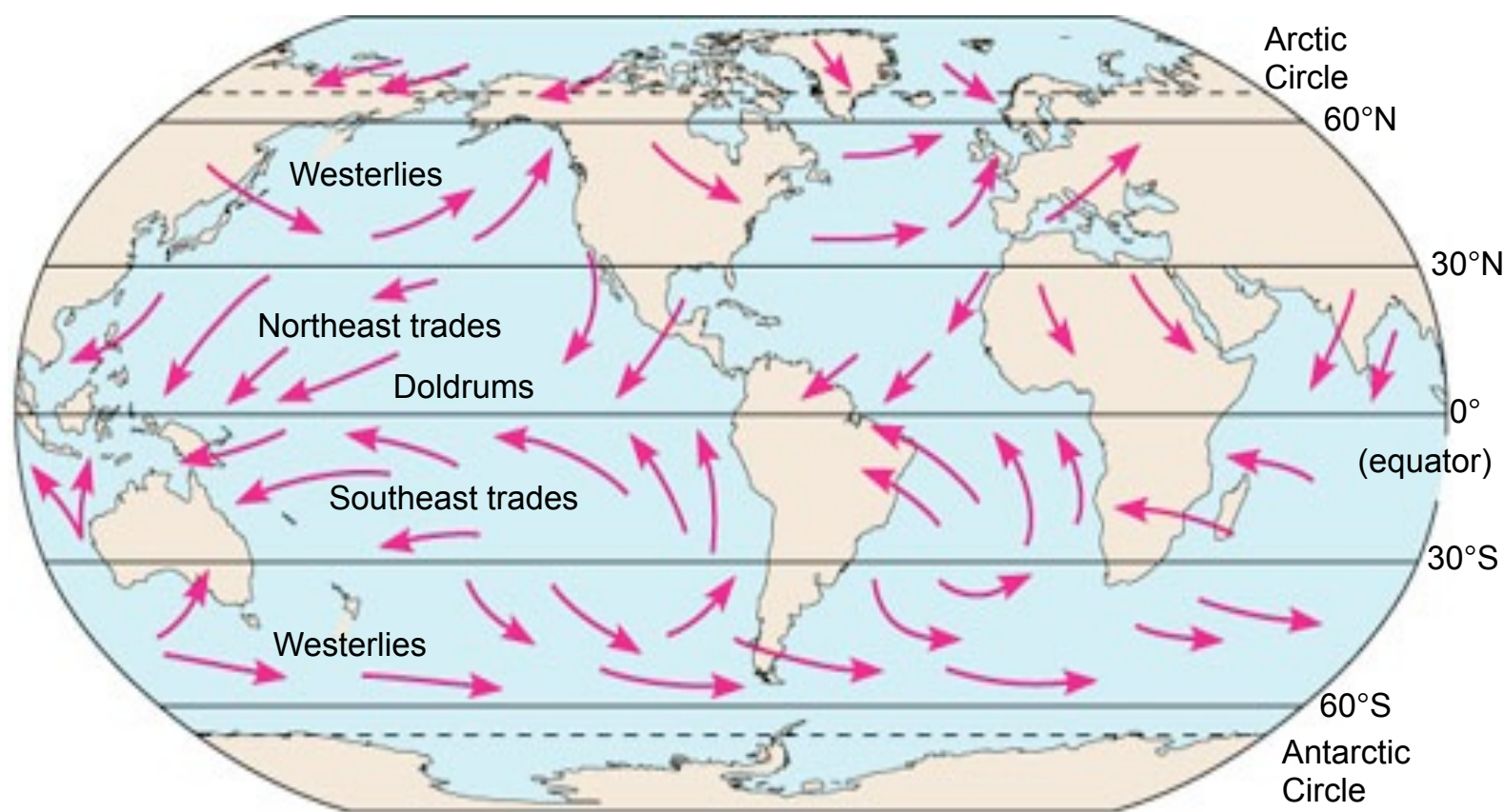
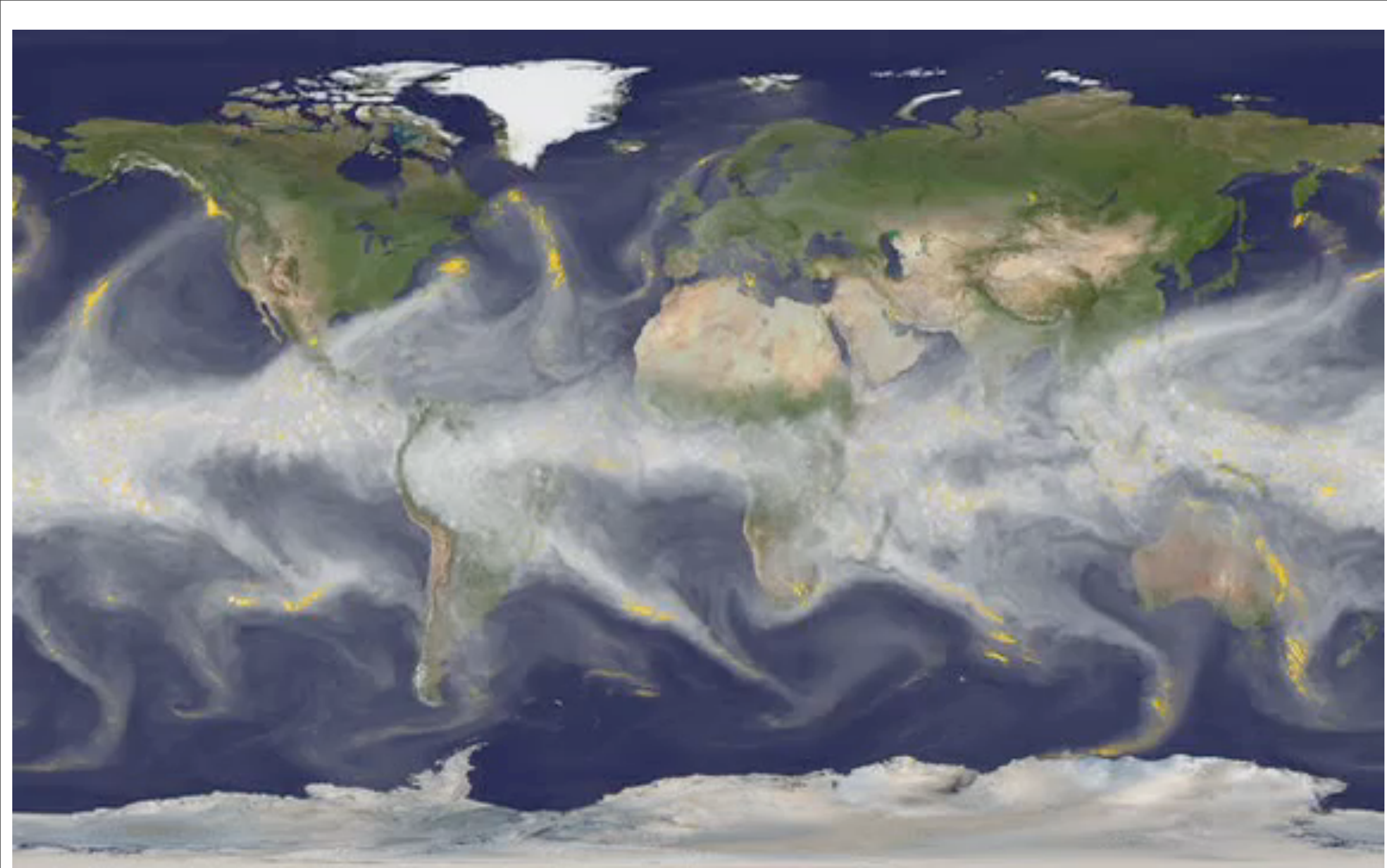


Figure 50.10



Can you name that tune?

Jimi Hendrix

The wind cries Mary



# Bottom Line!

Some Latitudes are warmer/cooler than others!

Some Latitudes are drier/wetter than others!

You have already learned or will learn that **temperature** and **water** are most important abiotic factors for terrestrial life and this explains the connection between latitude and the distribution of life on this planet.

# C. Global Climate Patterns

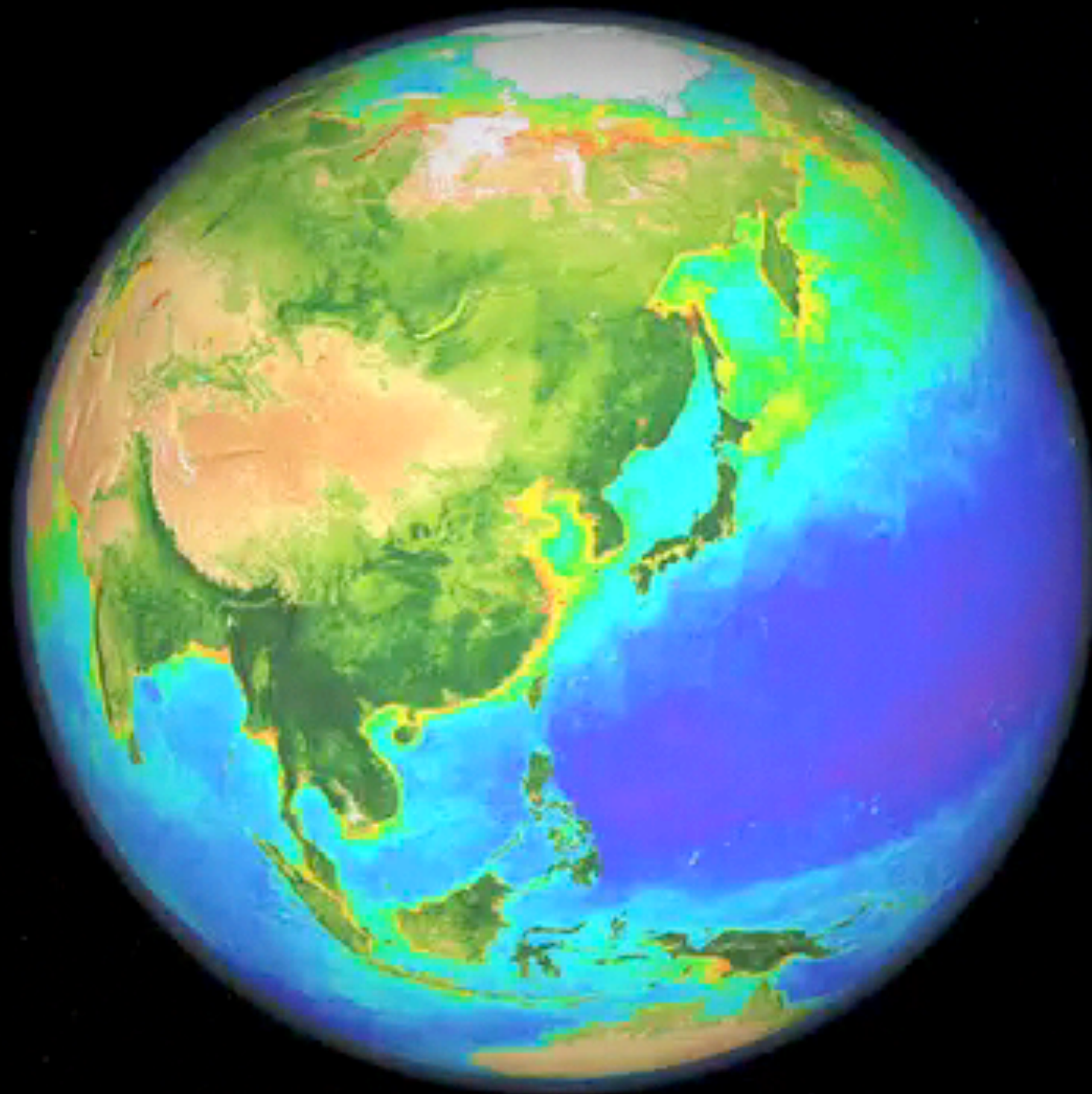
- The Sun is ultimately responsible for global climate patterns
- The heat from the sun (and the earth's rotation) create the wind, rain and temperature patterns of earth





# D. Regional & Local Climate

- At the same or similar latitudes climate can differ from one place to another
- At the same or similar latitudes climate can vary over time
- There are a variety of reasons for these variation
  - tilt of the earth on its axis, large bodies of water, mountains and an infinite number of other factors like fallen trees, caves etc



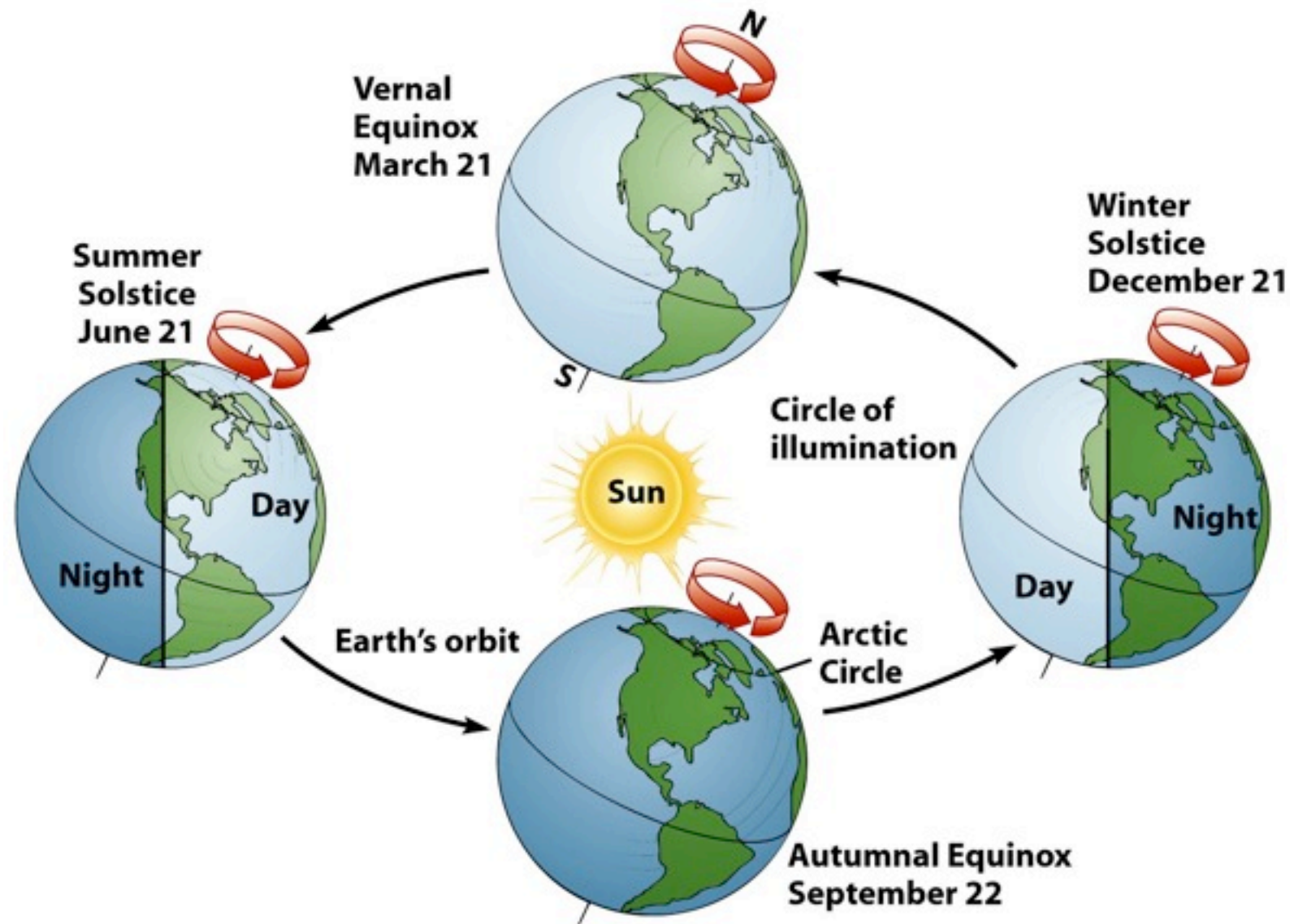


# 1. seasons

- Earth is tilted on its axis
- Earth Rotates around the sun over 365.25 days
- Therefore some parts of the Earth receive more or less sunlight over the course of the year
- *Remember Sunlight is the “climate’s engine” changing its intensity will also change wind & rain patterns, ocean currents, temperature, and length of daylight*
- *June 21st...24 hrs of light in Arctic and 24 darkness in Antarctica by December 21st the reverse is true in both locations*
- *Rainy season in Cairns, Australia from Jan-Mar and little to no rain from July-Sept*

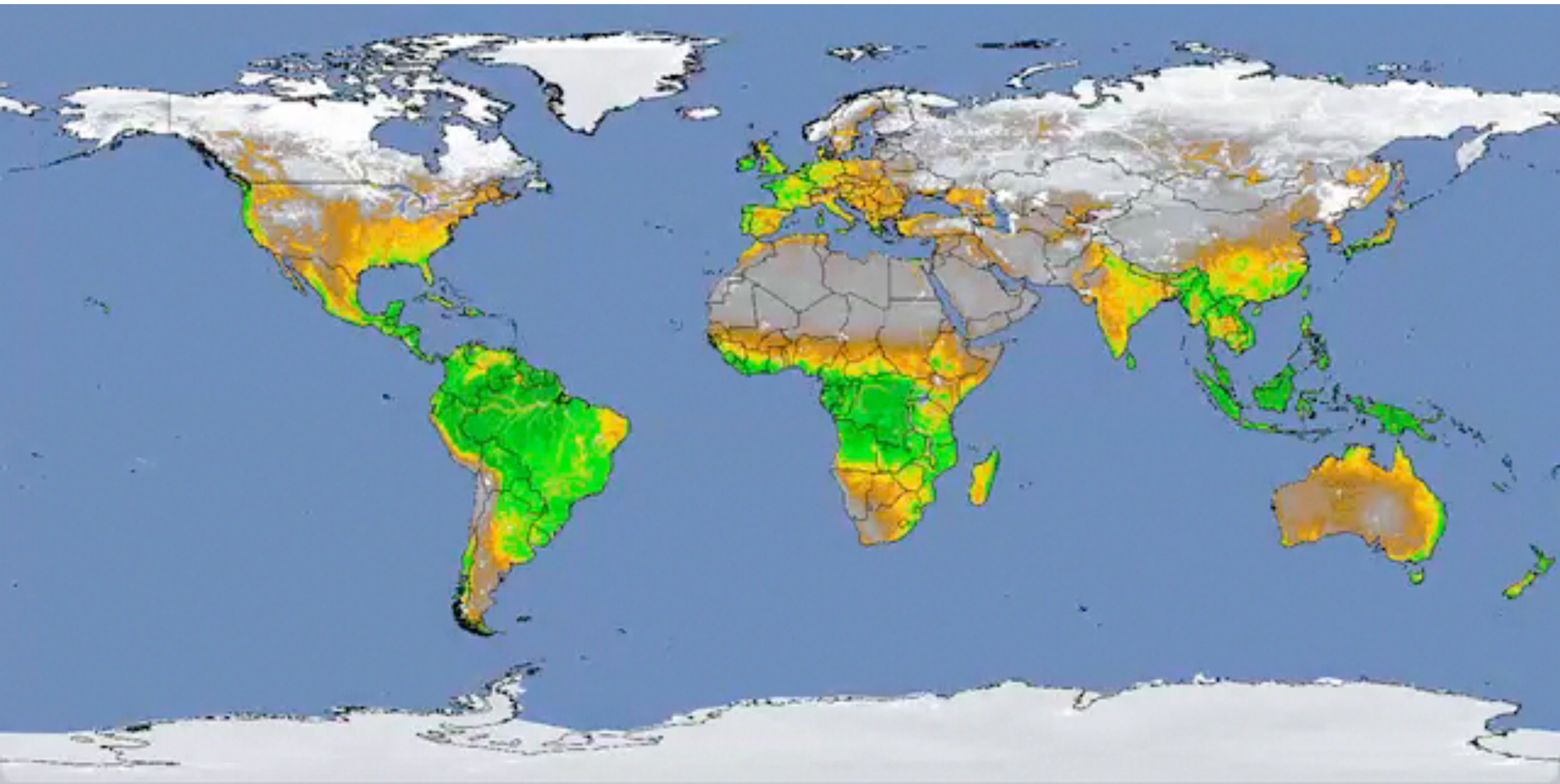
# 1. seasons

## SEASONAL VARIATION IN SUNLIGHT INTENSITY





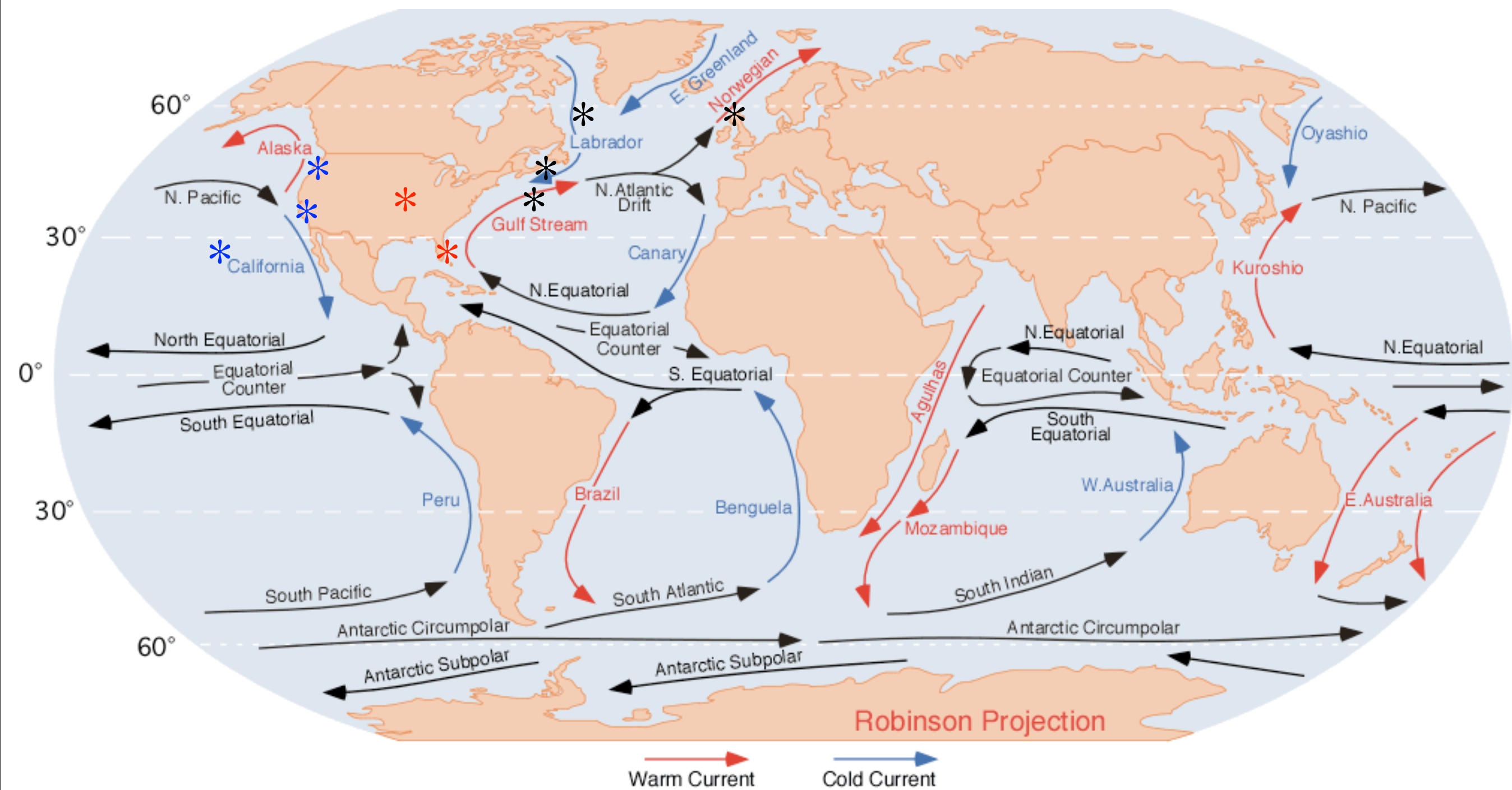




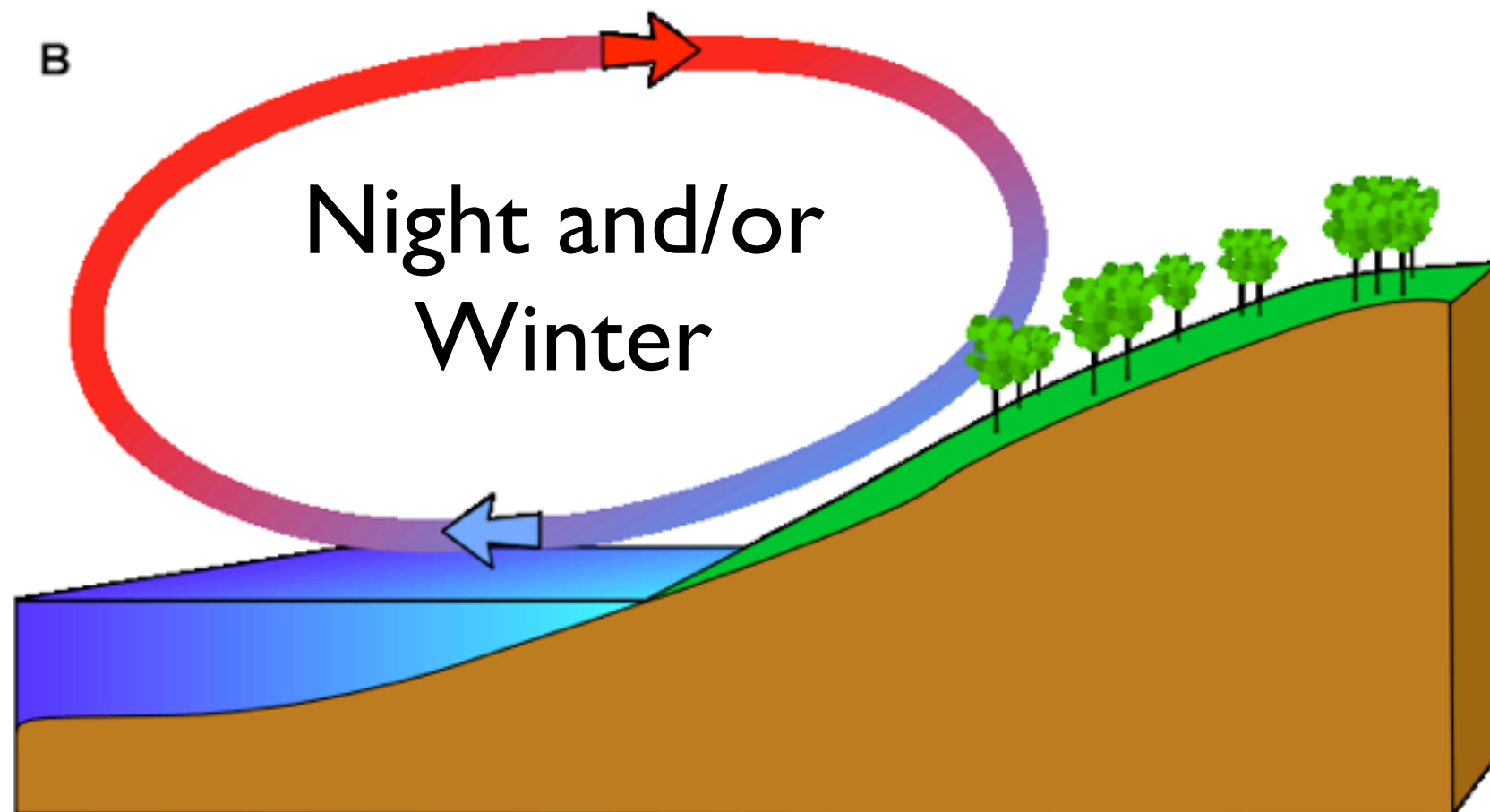
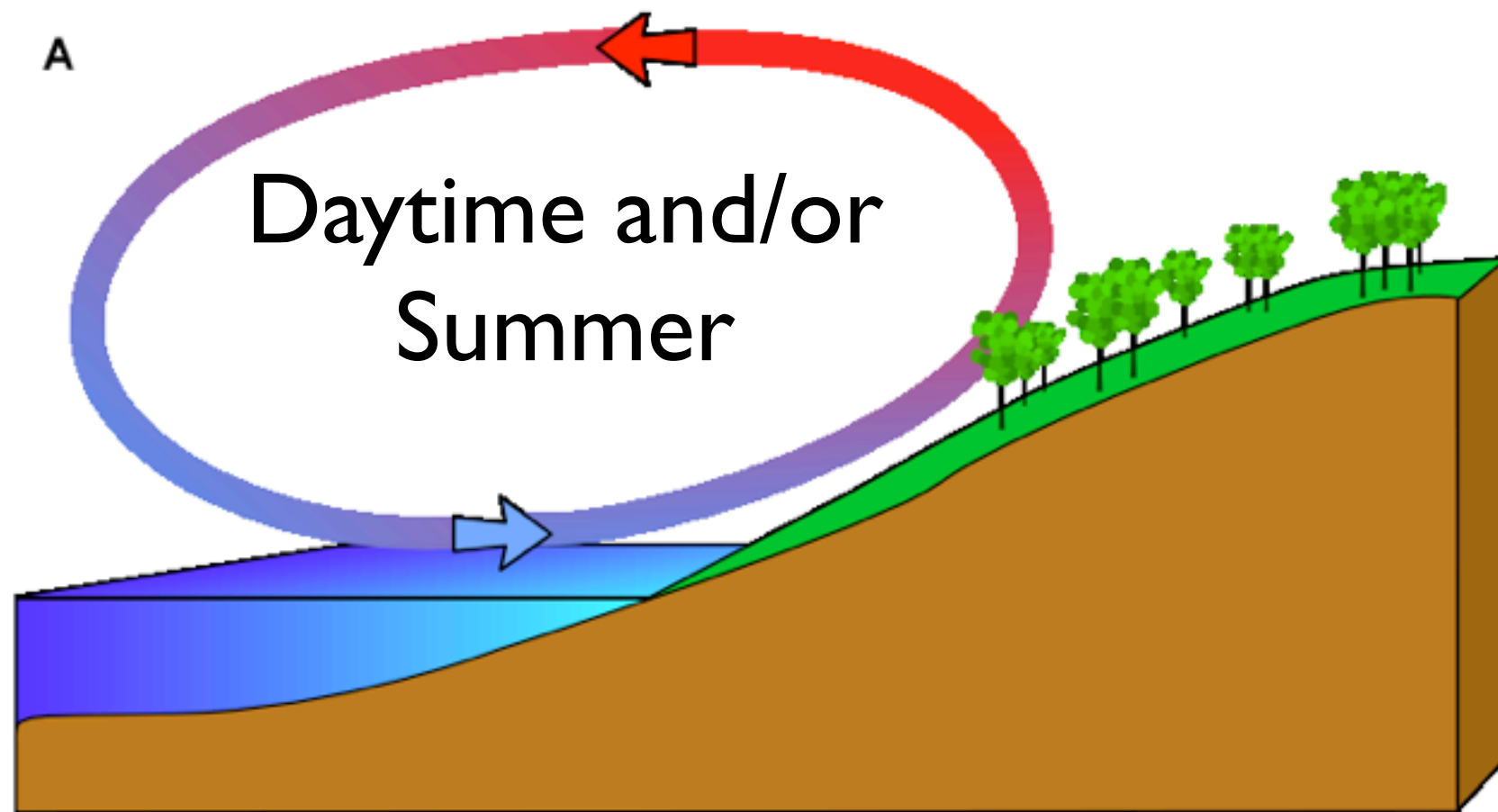


## 2. Large Bodies of Water

- \* Ocean currents can heat or cool land masses



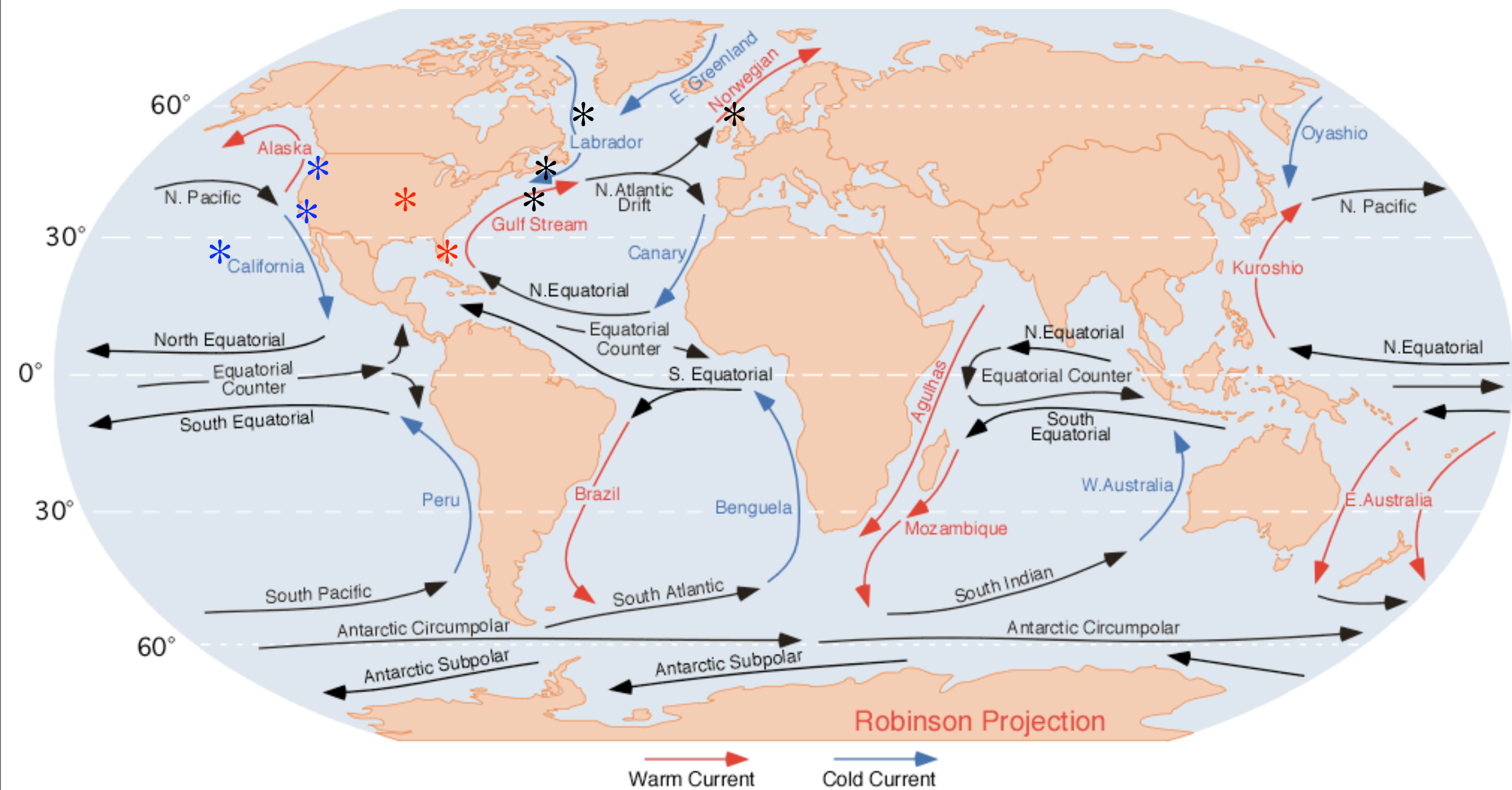




## 2. Large Bodies of Water

- \* Large bodies of water can moderate land temps.
- (review water's high specific heat)





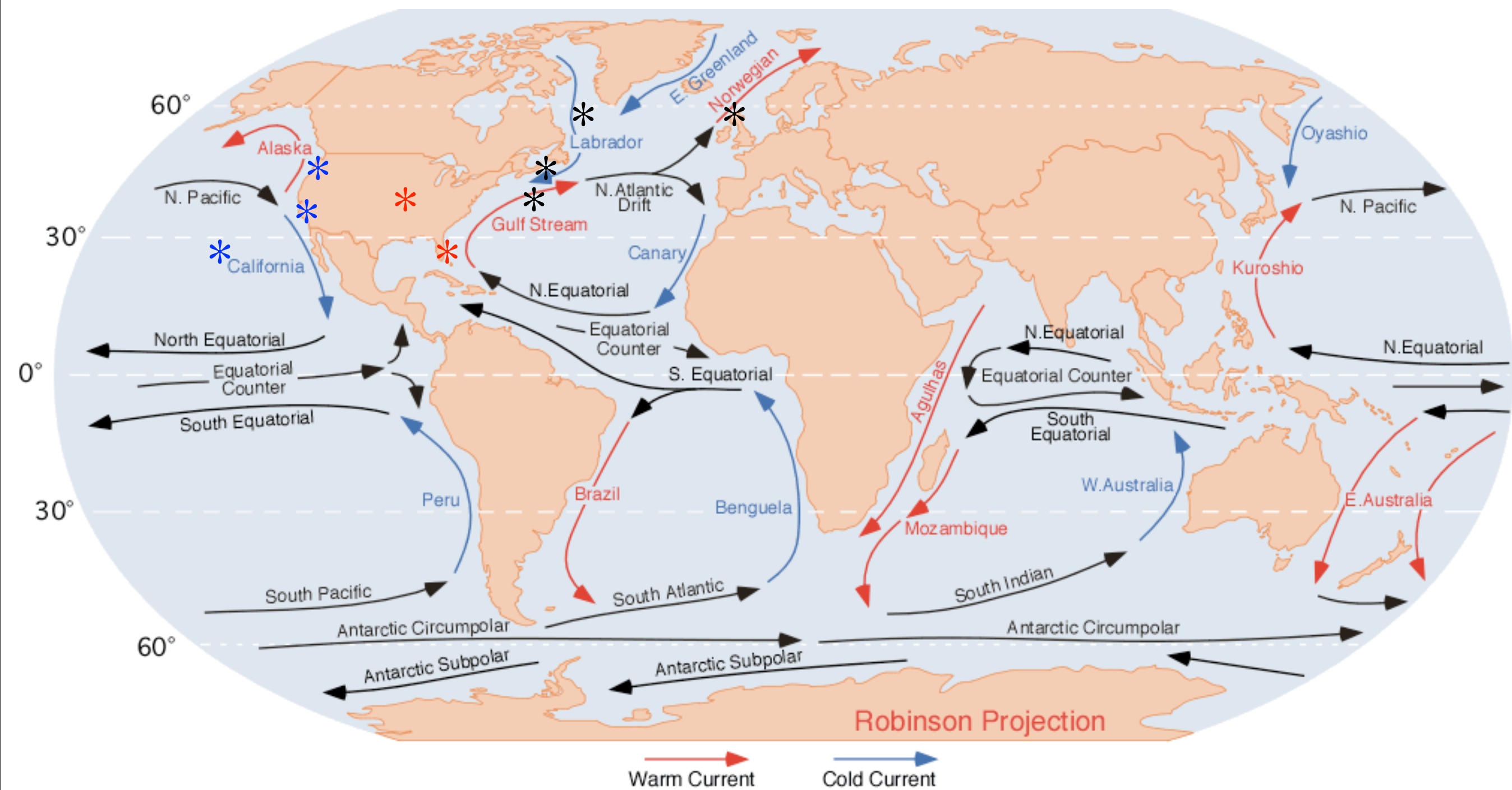


Friday, August 23, 2013



## 2. Large Bodies of Water

- \* Ocean currents can alter precipitation patterns
- (see map for examples)







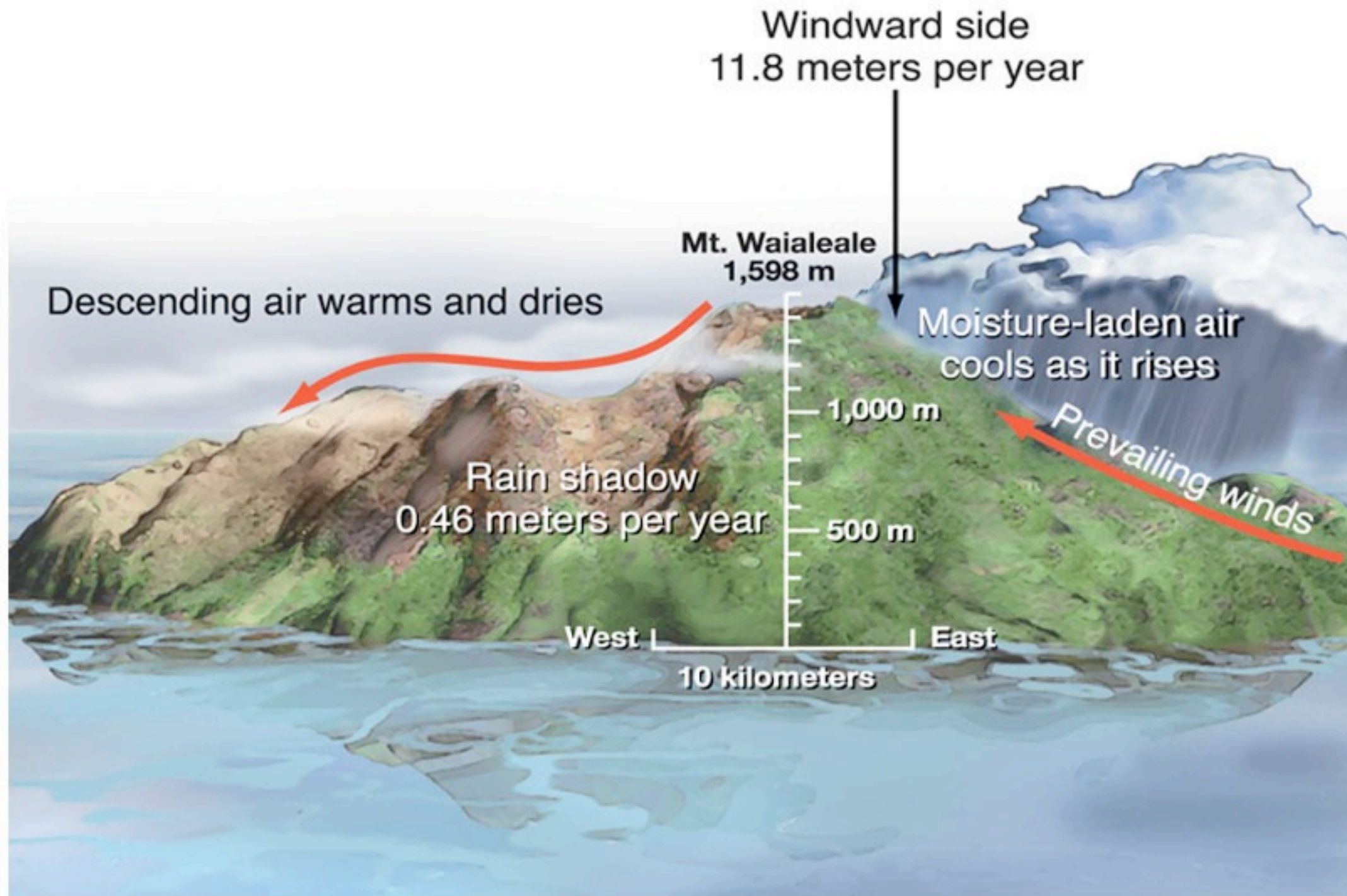




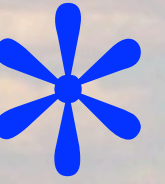


# 3. Mountains & Water

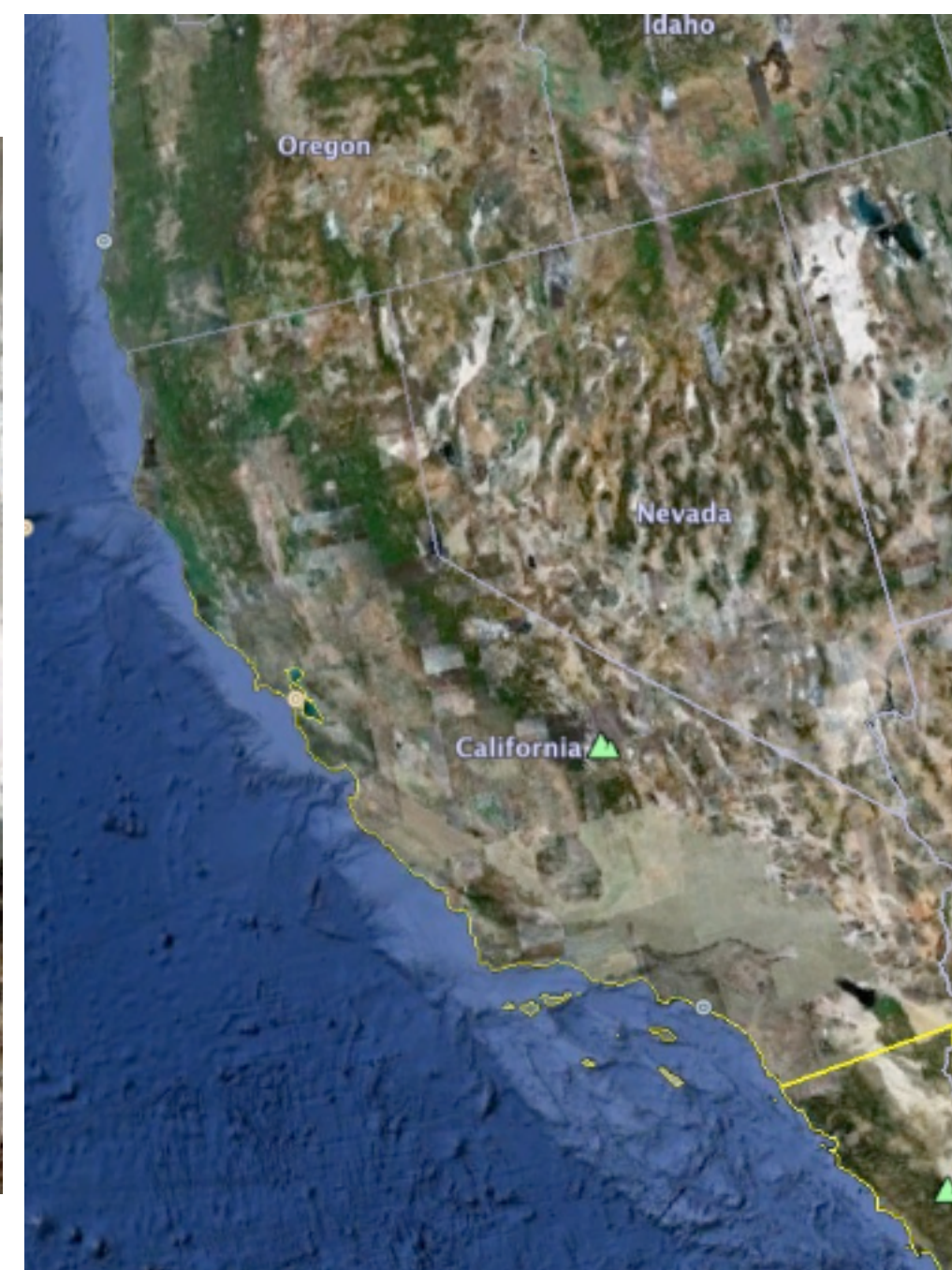
- “Rainshadows”











## 4. Mountains

- mountains can affect the amount and intensity of light thus they can alter *temperatures* and *precipitation* patterns

How can mountains affect temperature?

Answer: for every 1000m in elevation gain there is a 6 degree Celcius decrease in temperature (~13 degrees F)

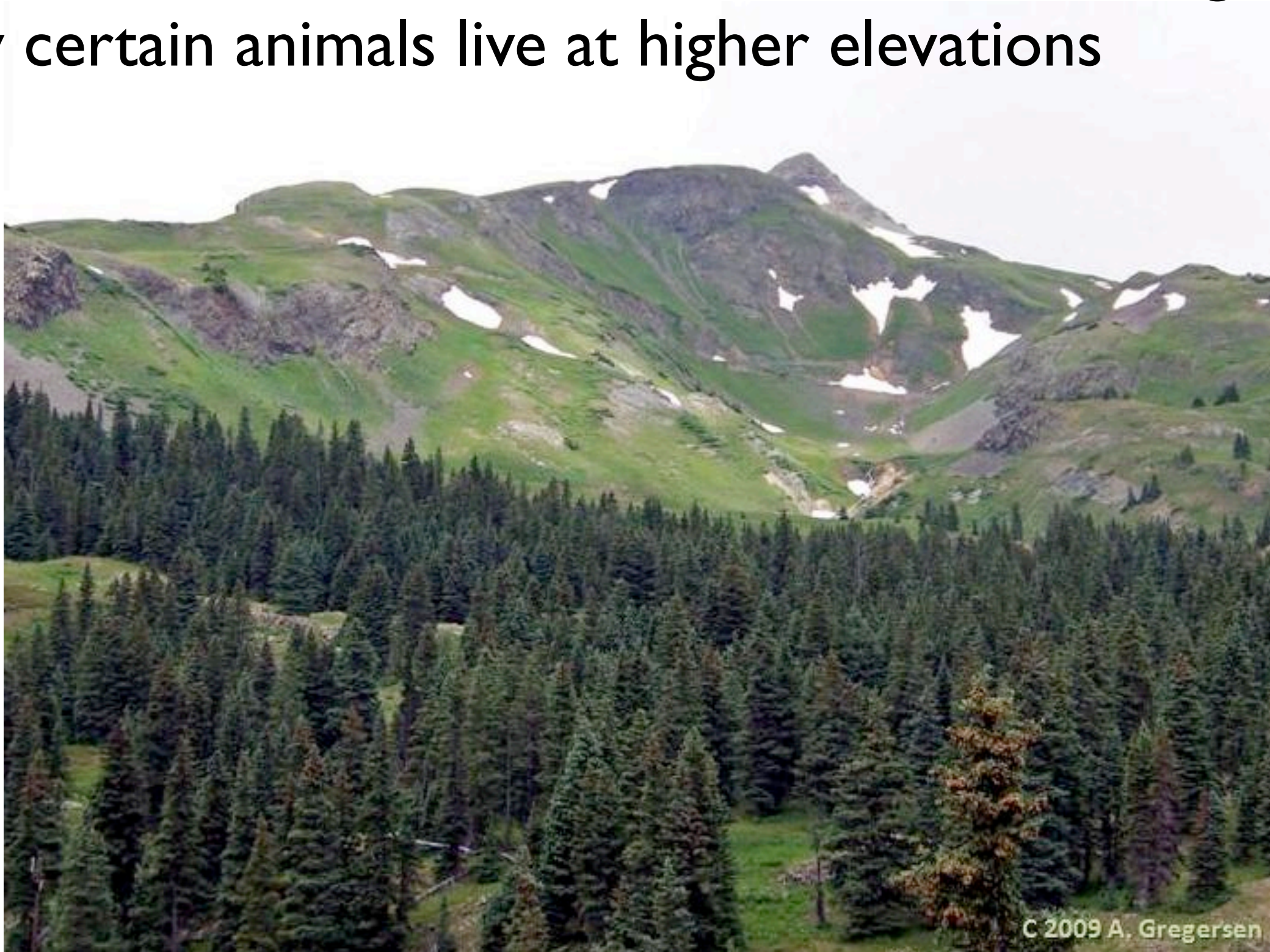
Will this effect the distribution of organisms on the mountain?

Answer: Absolutely, see illustration



## 4. Mountains

Notice the tree line in Colorado, like certain vegetation only certain animals live at higher elevations

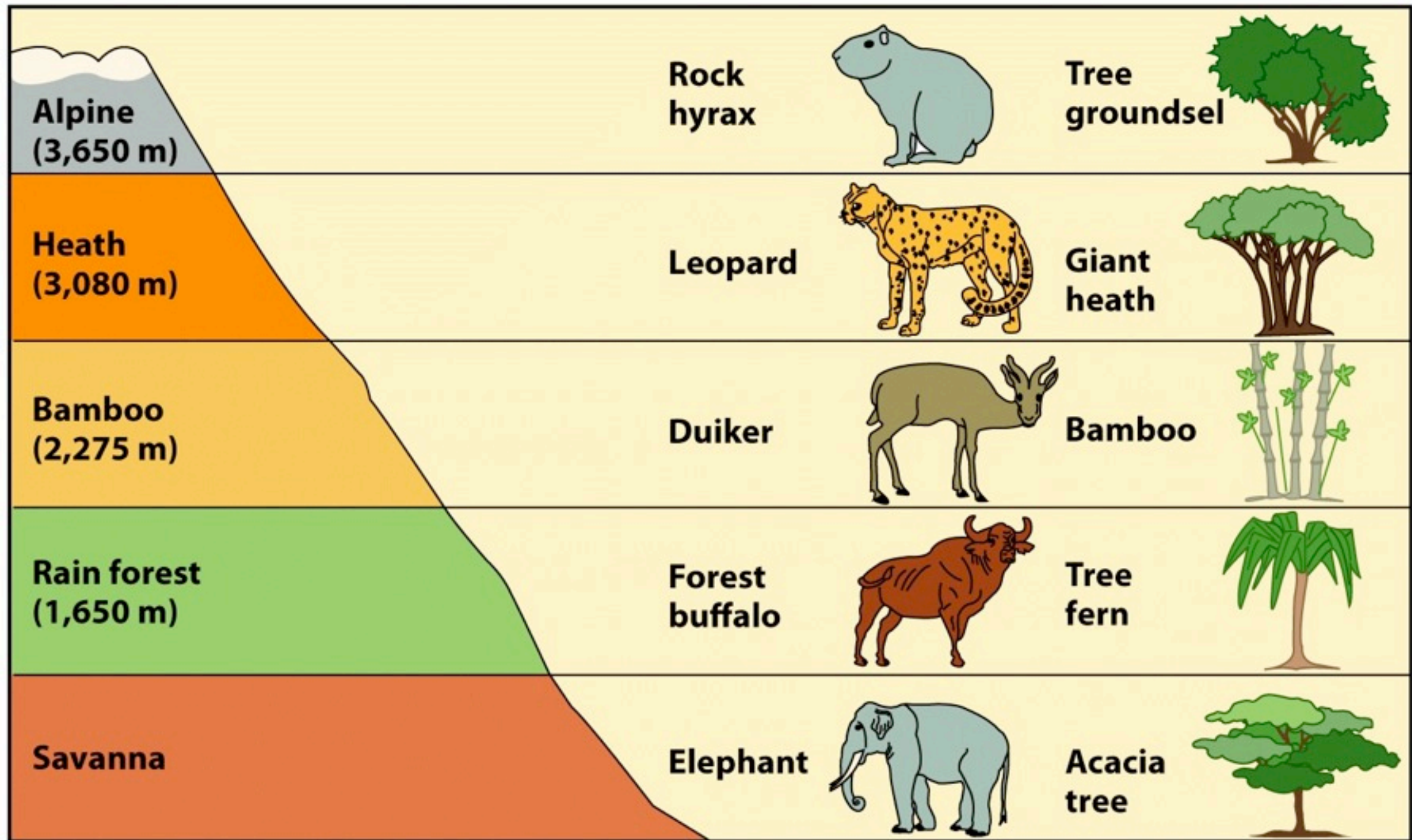


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# 4. Mountains

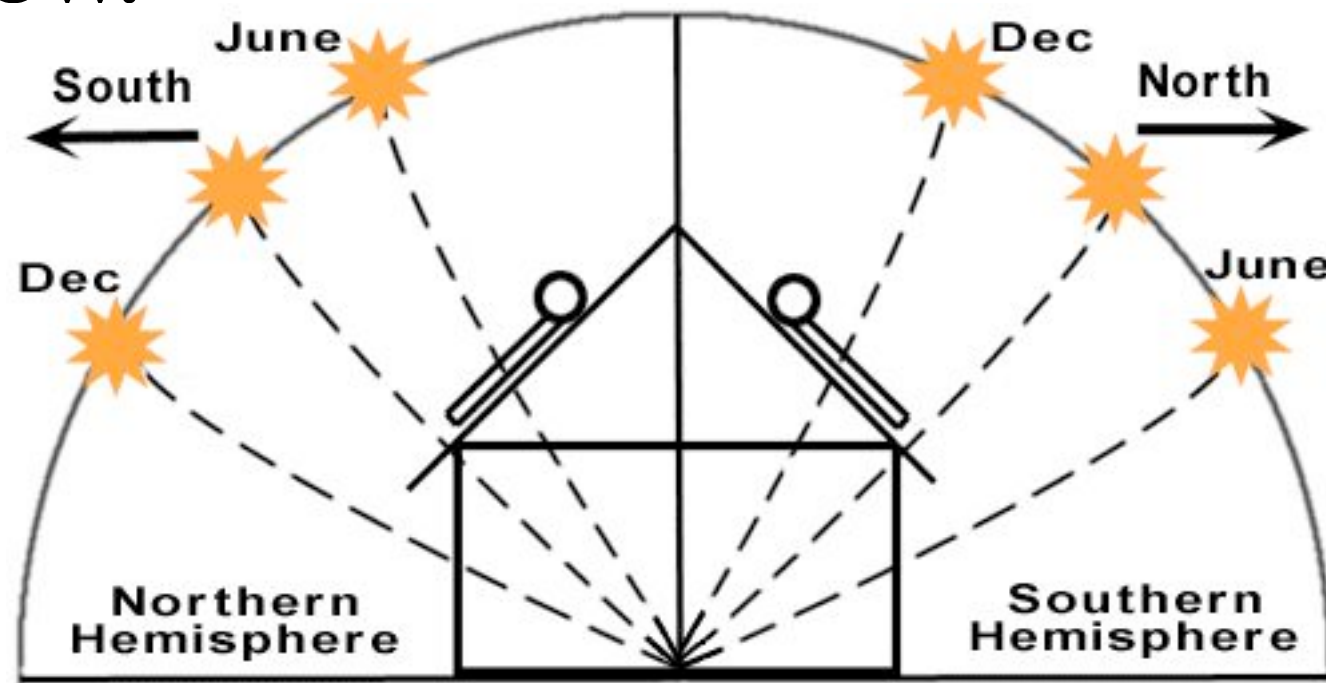
Below is another example illustrating the changing flora with elevation gain





## 4. Mountains

Compare the north and south facing slopes on the mountains below.



Which side will get more light?

Be warmer? More water?

Answer: in northern hemisphere the south facing

Answer : south slope, north slope

Would you expect the organisms to differ on each side?

Answer: Absolutely

# 4. Mountains

- compare the north and south facing slopes of a mountain range in the northern hemisphere



Conifers typically grow on north face where shrubby drought resistant plants grow on the south face



# E. MicroClimate

- Climate can vary within small distances due to local features
- Compare the following & Consider abiotic factors such as water, light, temperature & wind differences in each
  - below a fallen tree in a forest vs above the tree
  - under the canopy in a forest vs just outside the canopy
  - inside a cave vs outside
- Can you think of another local feature?

*Note: Abiotic factors effect biotic factors (life) and biotic factors can alter abiotic factors as well*



# Bottom Line!

**Climate effects the distribution and abundance of life.**

**Climate can vary for a number of different reasons.**

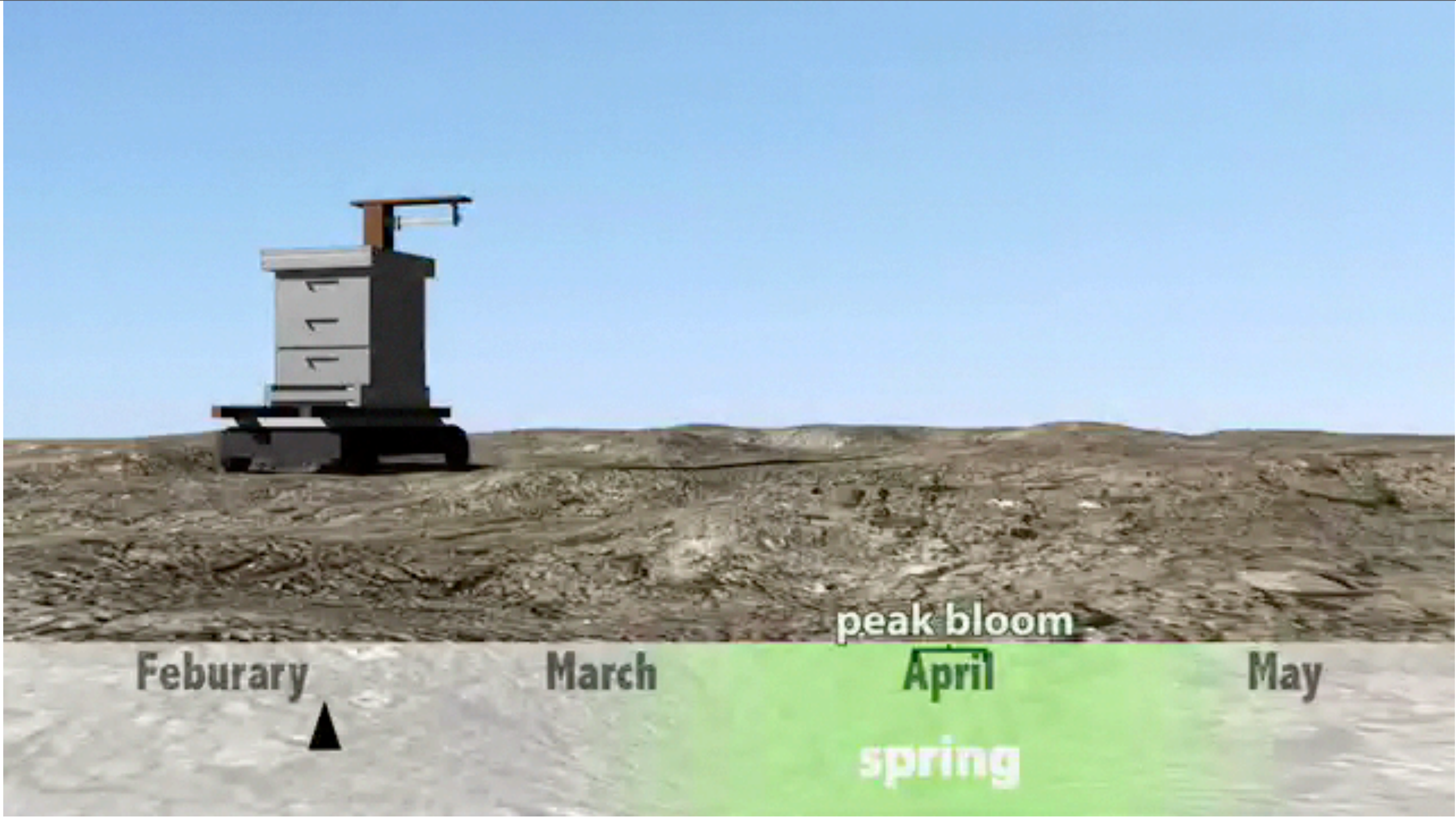
**Life will flourish where temperatures are moderate and rainfall is abundant.**

# F. Global Climate Change

- Climate effects the distribution and abundance of organisms
- Change the climate...change both of these above
- **Altering these changes ecosystem dynamics and potentially the services they provide**
  - plants link us to the ultimate source of all energy...the sun!
  - autotrophs provide oxygen
  - wetlands filter water and buffer storm surge

Note: The scientific method! A hypothesis (possible explanation) leads to expected results (predictions) when actual results (data) match the expected results then we have support for our hypothesis. Global warming is no longer conjecture an abundance of evidence exists.







**Table 4.1 Ecosystem Services**

<b>Ecosystem</b>	<b>Services Provided by Ecosystem</b>
<b>Forests</b> Ex. Mangroves & Indonesian Tsunami	Purify air and water; produce and maintain soil; absorb carbon dioxide (carbon storage); provide wildlife habitat; provide humans with wood and recreation
<b>Freshwater systems</b> (rivers and streams, lakes, and groundwater)	Moderate water flow and mitigate floods; dilute and remove pollutants; provide wildlife habitat; provide humans with drinking and irrigation water, food, transportation corridors, electricity, and recreation
<b>Grasslands</b>	Purify air and water; produce and maintain soil; absorb carbon dioxide (carbon storage); provide wildlife habitat; provide humans with livestock and recreation
<b>Coasts</b>	Provide a buffer against storms; dilute and remove pollutants; provide wildlife habitat, including food and shelter for young marine species; provide humans with food, harbors, transportation routes, and recreation
<b>Sustainable agricultural ecosystems*</b>	Produce and maintain soil; absorb carbon dioxide (carbon storage); provide wildlife habitat for birds, insect pollinators, and soil organisms; provide humans with food and fiber crops

\*Sustainable agricultural ecosystems are human-made and therefore inherently different from other ecosystems. Sustainable agriculture is discussed in Chapter 19.  
(Adapted from *Climate Change Impacts in the United States*)



# F. Global Climate Change

- **The changing distribution of organisms is well documented and are all consistent with a warming world**
- Over the last decade *Snow crab* have extended their 500 km to the north in search of colder water
- *Marmots* in Colorado are emerging from hibernation 3 weeks earlier than in the 1970's
- *Tree swallows* have advanced their egg laying by 9 days from 40 years ago
  - Countless more examples of animals extending their range north, flowers blooming earlier, migratory patterns changing, stunted growth in certain trees, tropical diseases spreading north, etc

# F. Global Climate Change

- Most people do not understand the sensitivity of organisms and ecosystems to biotic and abiotic factors
- Human blood pH is maintained between 7.35-7.45
- El Nino occurs as a result of 2 degrees of warming
- need more examples

*Climate change is much more than global warming it is shifting of climate patterns...places that historically had abundant rain may have droughts, floods occurring in otherwise arid regions, changes in season lengths, more frequent and severe storms, etc.*



# Stop and Think

Which latitude(s) would have the most pronounced seasons?

Would you expect adapting to life in these latitudes to be more or less challenging?

Can you think of any general or specific adaptations found in these parts of the world?

How is climate change today different from past geological episodes?