

# Claim Evidence Reasoning Activity

The effect of CO<sub>2</sub> on temperature

# Vocabulary

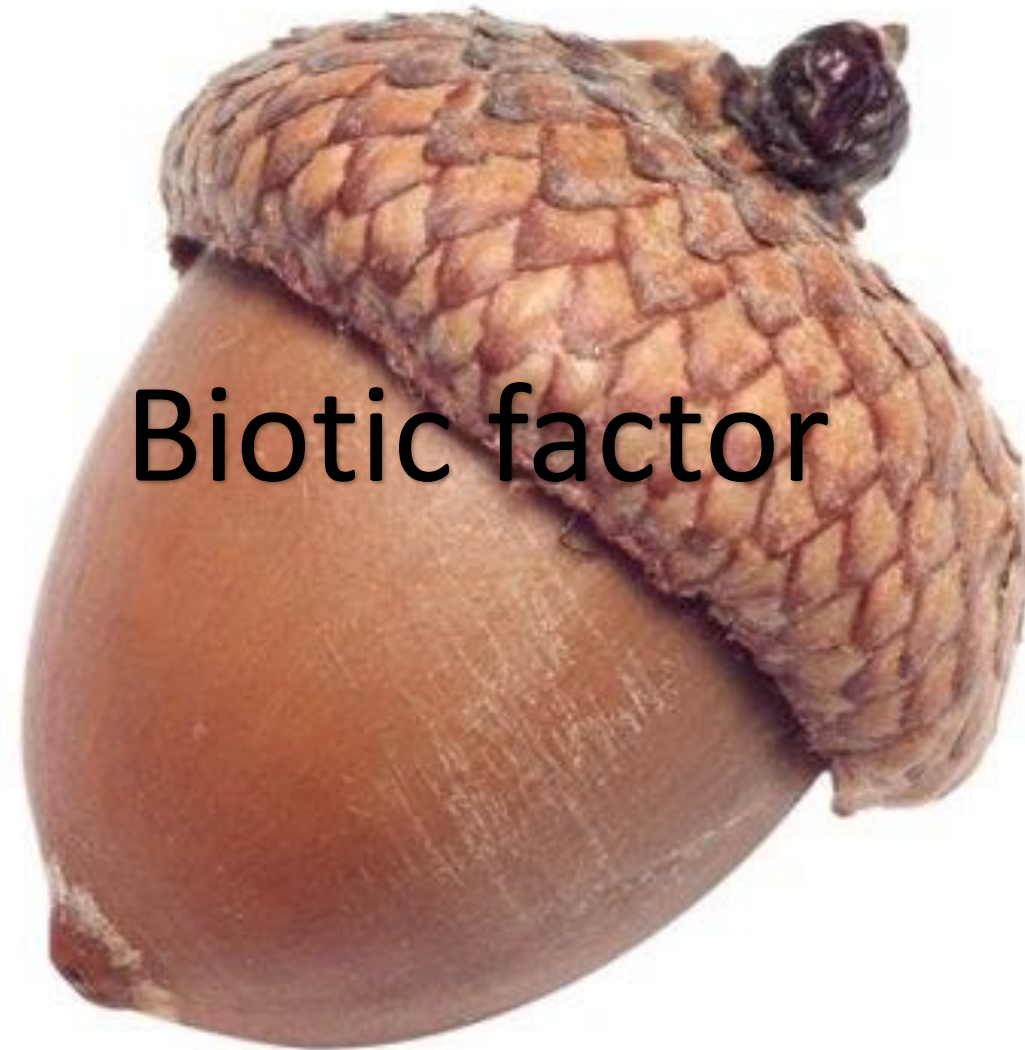
- Ecosystems
- Biotic factor
- Abiotic factor

Water

**Abiotic factor**

A high-speed photograph of a water splash. The water is clear and bright blue, with a large, rounded peak at the top center. Below the peak, the water spreads out, creating a wide, shallow layer. Numerous small, spherical bubbles are scattered throughout the lower portion of the splash, particularly in the area where the water is spreading. The background is a plain, bright white, which makes the blue water stand out sharply.

Acorn seed



**Biotic factor**

# Forrest

# Ecosystem



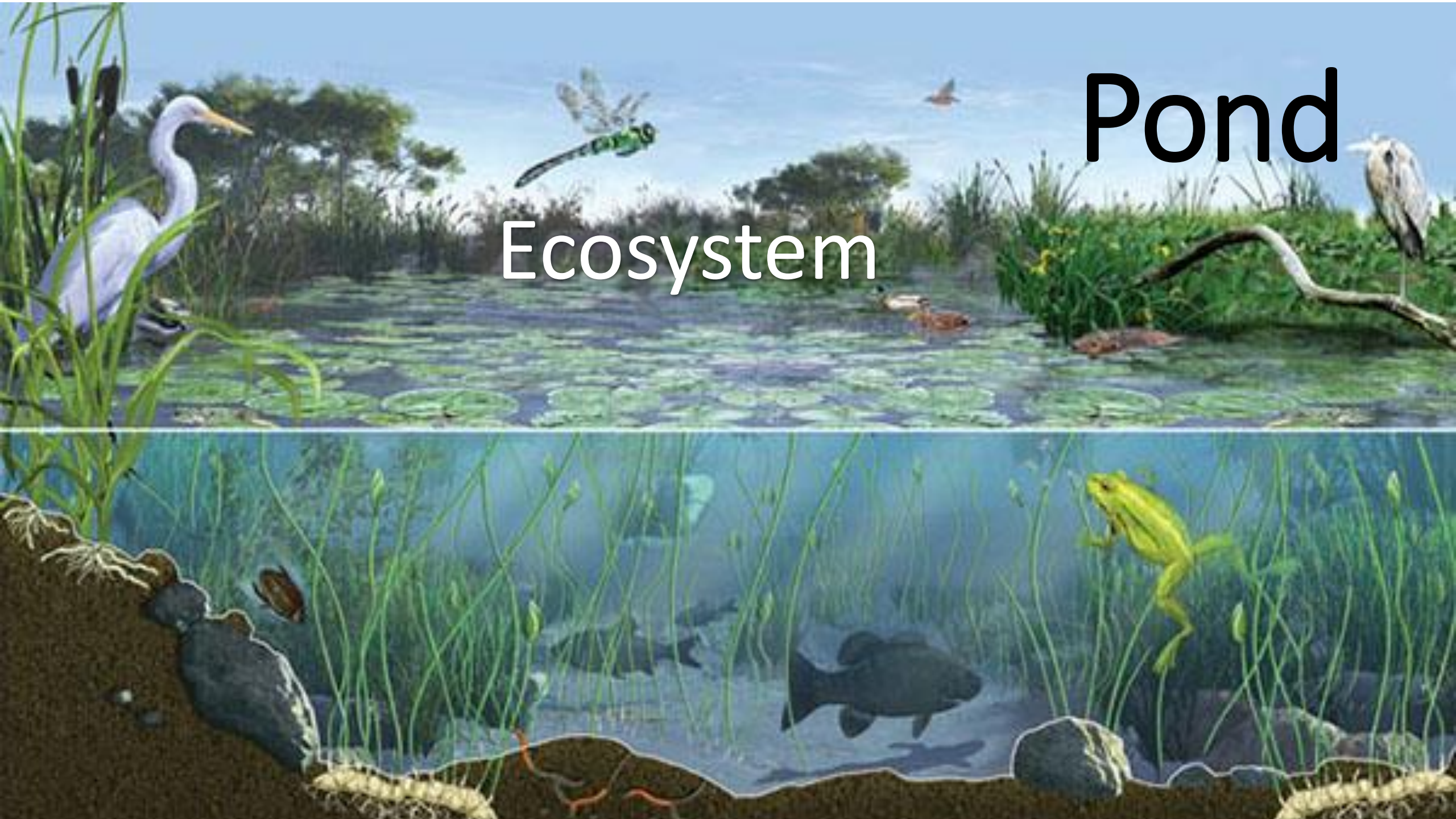
**Bacteria**

**Biotic Factor**



# Pond

## Ecosystem



**Wind**

**Abiotic factor**





Animal

Biotic factor



# Sunlight

A bright sun is rising over a horizon, with rays of light spreading across the sky. The sun is a large, glowing white semi-circle, and the sky is a deep orange color. The horizon is a dark, silhouetted line at the bottom of the image.

Abiotic factor

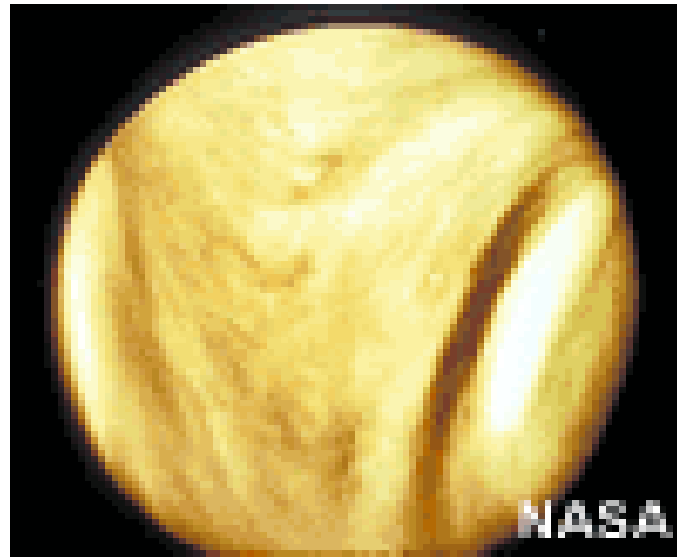
Why is Earth the only planet filled with life?

An underwater photograph showing sunlight rays filtering through the water surface, creating a serene and deep blue environment. The rays are most prominent in the center, where they appear as bright, vertical beams of light. The water surface is visible at the top, with gentle ripples and a shimmering effect from the light. The overall color palette is a range of blues, from deep navy to bright cyan.

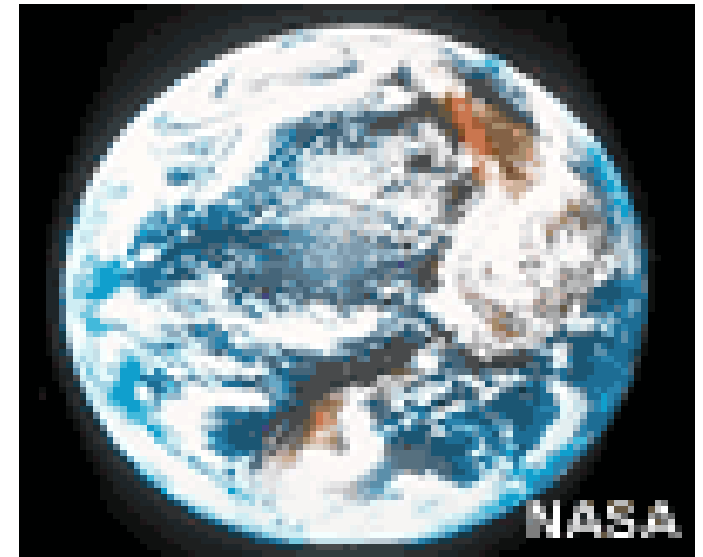
# Liquid Water

Atmosphere → right amount of solar energy  
(not too much and not too little)





**Venus**



**Earth**

<b>Carbon Dioxide (CO<sub>2</sub>)</b>	<b>96.5%</b>	<b>0.03%</b>
<b>Nitrogen (N<sub>2</sub>)</b>	<b>3.5%</b>	<b>78%</b>
<b>Oxygen (O<sub>2</sub>)</b>	<b>Trace</b>	<b>21%</b>
<b>Argon (Ar)</b>	<b>0.007%</b>	<b>0.9%</b>
<b>Methane (CH<sub>4</sub>)</b>	<b>0</b>	<b>0.002%</b>

# What is our atmosphere made mostly of?

- Nitrogen and oxygen

# What is the atmosphere of Venus made mostly of?

- Carbon dioxide

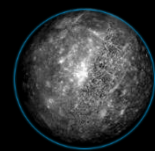
# Set up an experiment to determine the **effect of CO<sub>2</sub> on global temperature**

- Independent variable
- Dependent variable
- Control group
- Describe how you can test this theory
- Make a claim
- Gather evidence





Mercury  
333° F



Venus  
+855° F

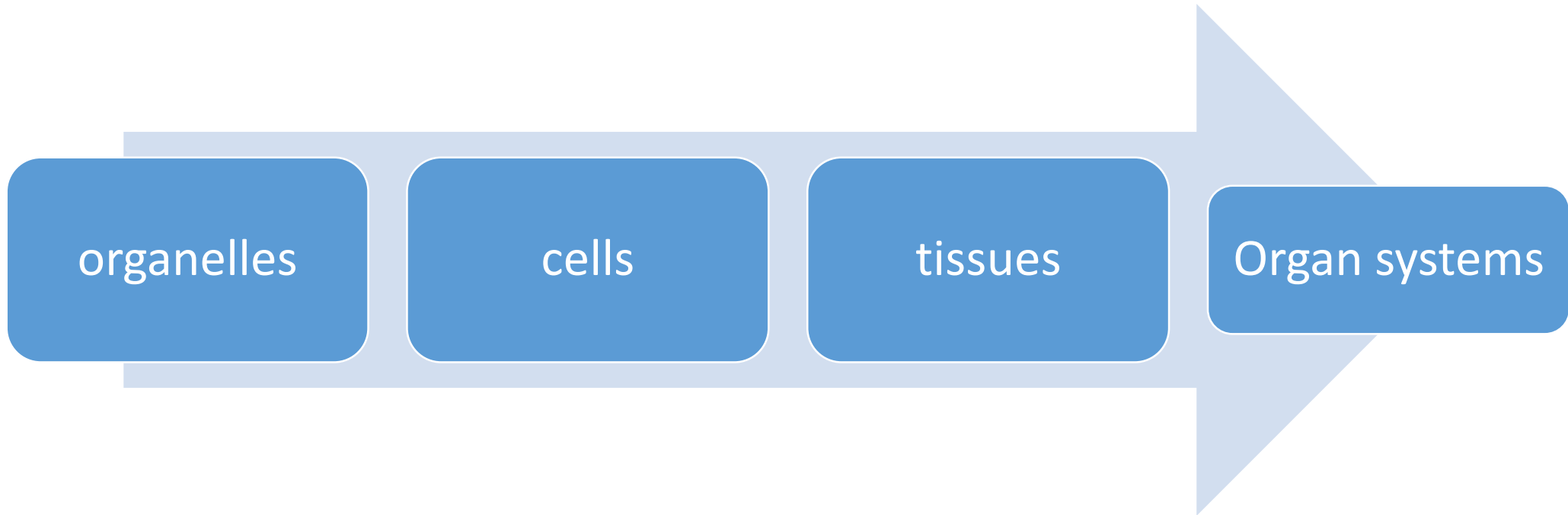


Earth  
59° F



# Levels of Organization

Smallest → biggest



# Levels of Organization in Ecosystems



# Population

- = all the members of 1 species in 1 area
- Example
- moose in the Adirondacks



# Community

- many populations interacting
- Example:
- Herbivore communities in a grassland



# Ecosystem

- biotic and abiotic factors interacting in a given area.
- **Examples:**
- forest, pond



Biosphere = portion of Earth that supports life

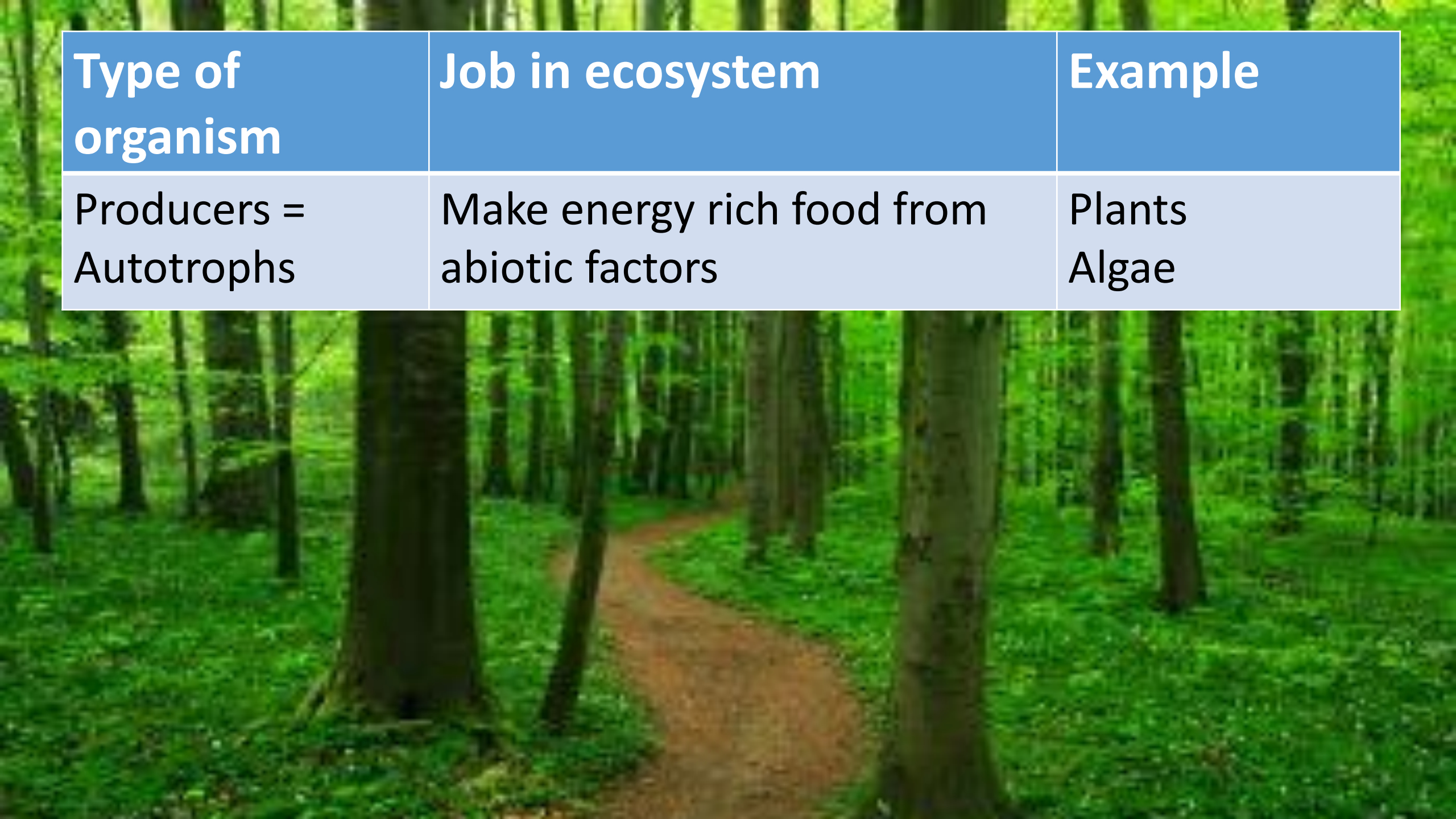




Smallest → biggest



Types of organisms in an ecosystem



Type of organism	Job in ecosystem	Example
Producers = Autotrophs	Make energy rich food from abiotic factors	Plants Algae

Type of organism	Job in ecosystem	Example
Consumer = Heterotrophs	Cannot make their own food need to eat other organisms	Animals, fungi, decomposers





**Heterotroph**

**Autotroph**



Type of organism	Job in ecosystem	Example
Herbivore	Type of consumer that eats only plants	Deer Rabbits

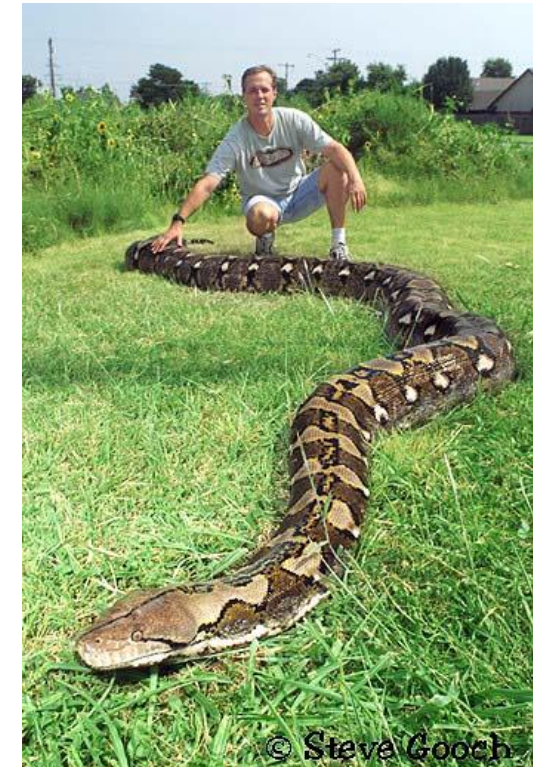


Type of organism	Job in ecosystem	Example
Omnivore	Type of consumer that eats plants and animals	Bear Raccoon





Type of organism	Job in ecosystem	Example
Carnivore	Type of consumer that eat animals only	Lion, tiger, annacondas



Type of organism	Job in ecosystem	Example
Decomposers	Organisms that break down dead organisms Job = <u>Recycle Nutrients</u>	Bacteria and fungi



Type of organism	Job in ecosystem	Example
Predators	Animals that hunt and kill prey	Lion



Type of organism	Job in ecosystem	Example
Prey	Animal that gets hunted	Mouse

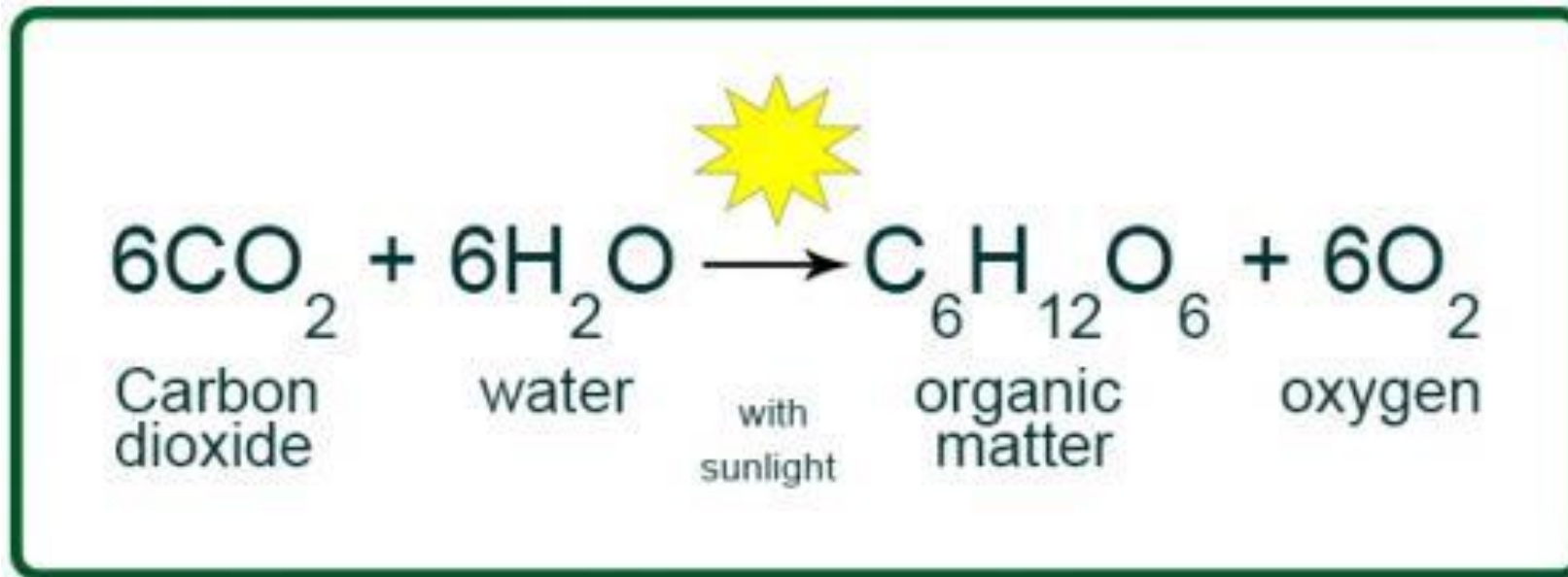


Finish Unit 1 habitable worlds part 2 notes

# The Carbon Cycle

- 2 processes affecting the carbon cycle = Photosynthesis and Respiration

Formula for photosynthesis (process that happens in plants)



# Formula for respiration

(process plants and animals use to release energy)

## Cell Respiration Formula



Glucose

Oxygen

Carbon

Water

Energy

Dioxide



# Carbon Cycle

- Carbon cycles between air, land and organisms
- All living things contain carbon
- **Fossil fuels** (coal, oil, gas)
  - come from remains of living organisms
  - All fossil fuels contain carbon
- **Photosynthesis** → ↓ CO<sub>2</sub> in air

# Processes that release C into the air

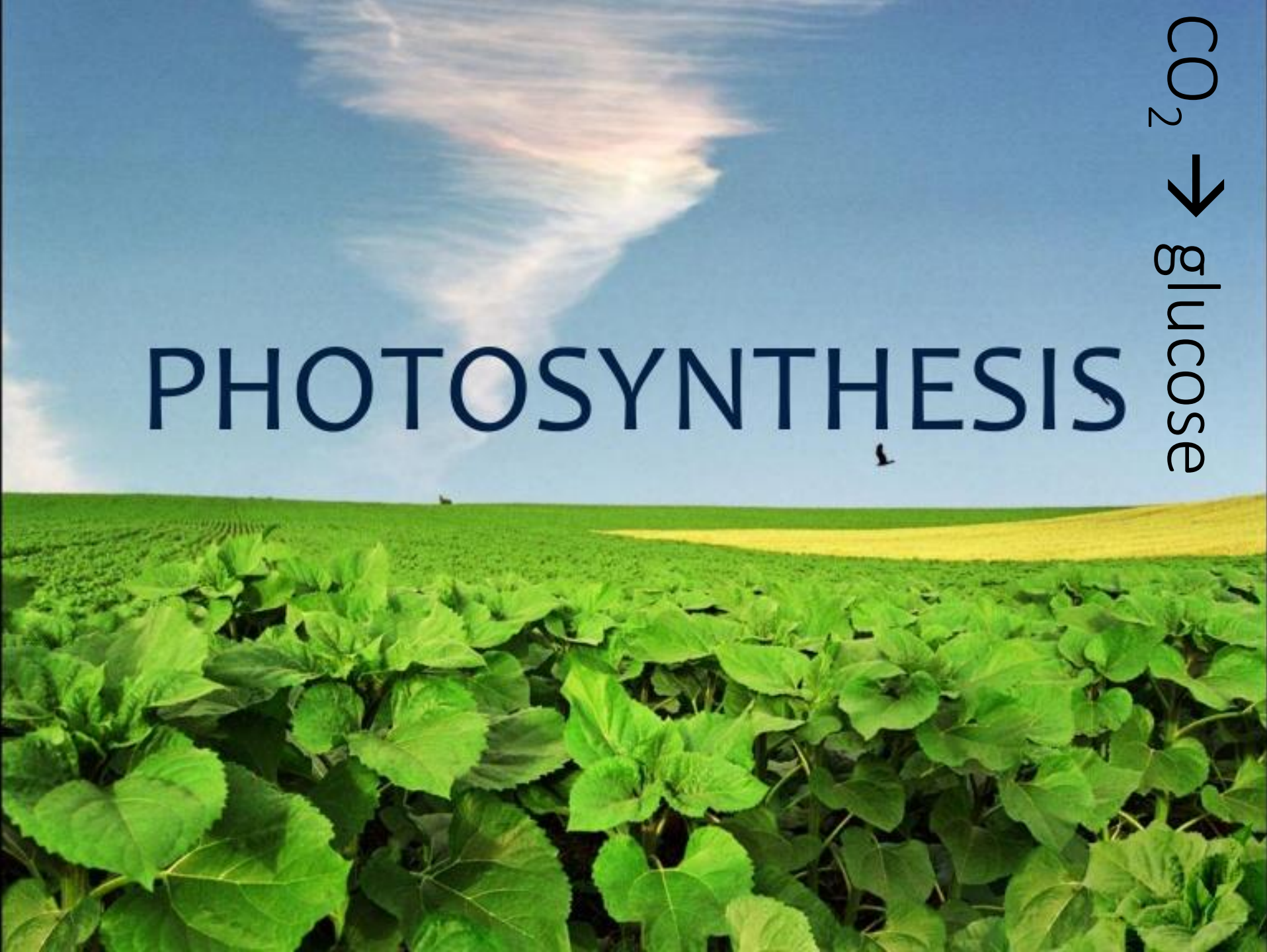
- **Aerobic Respiration** – organism use  $O_2 \rightarrow \uparrow CO_2$  in air
- **Anaerobic respiration** – organisms without oxygen  $\rightarrow \uparrow$  methane in air ( $CH_4$ )
- **Decomposition**  $\rightarrow \uparrow CO_2$  in air
- **Combustion (burning)**  $\rightarrow \uparrow CO_2$  in air
- Volcanoes release carbon

# Note only 2 ways to take carbon out of air

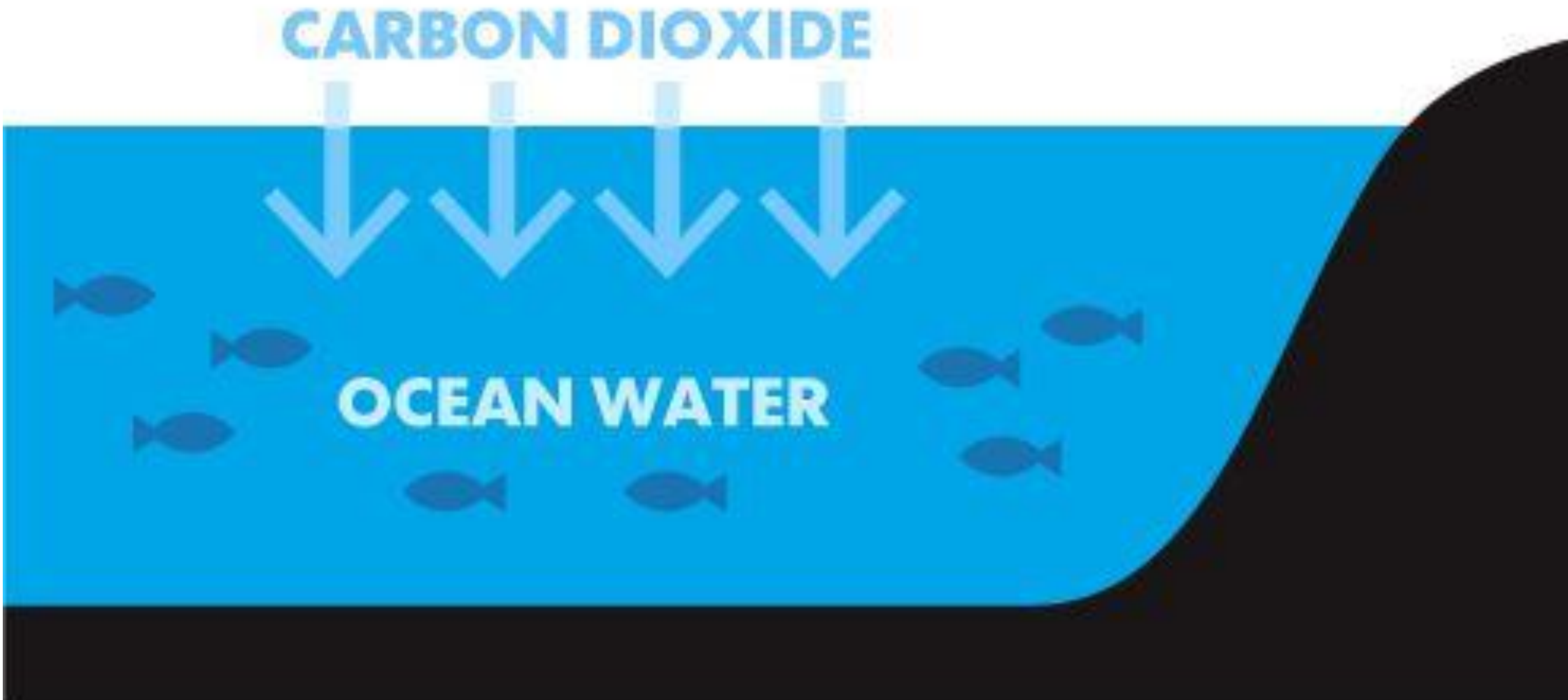
- Photosynthesis = process that pulls carbon out of the air.
- Therefore - plants and forests = carbon sinks
  
- Air mixes with the ocean
- Therefore - the ocean = carbon sink
- when CO<sub>2</sub> enters the ocean it forms carbonic acid

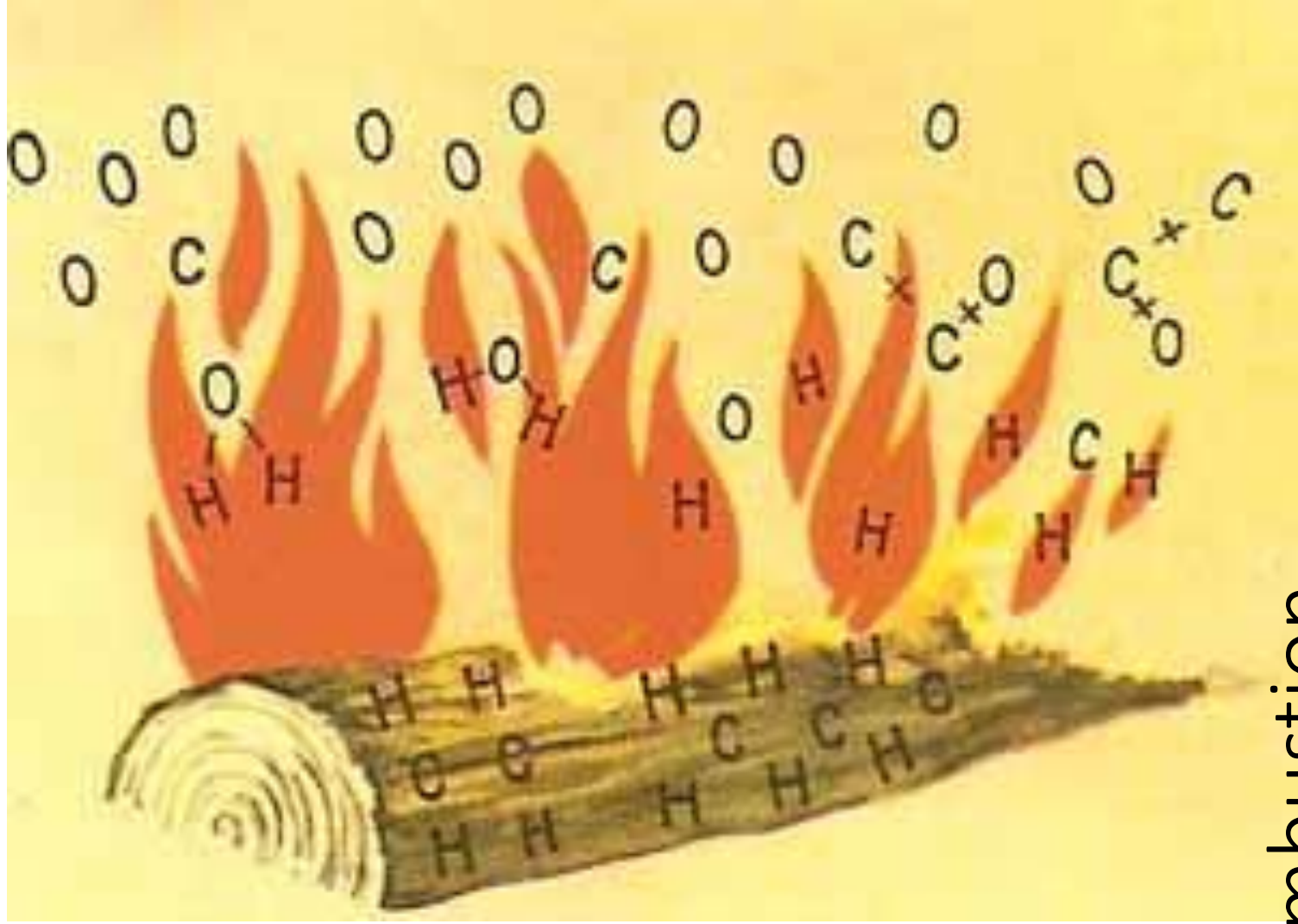
$\text{CO}_2 \rightarrow \text{glucose}$

# PHOTOSYNTHESIS



Ocean air mixing  
 $\text{CO}_2 \rightarrow$  carbonic acid





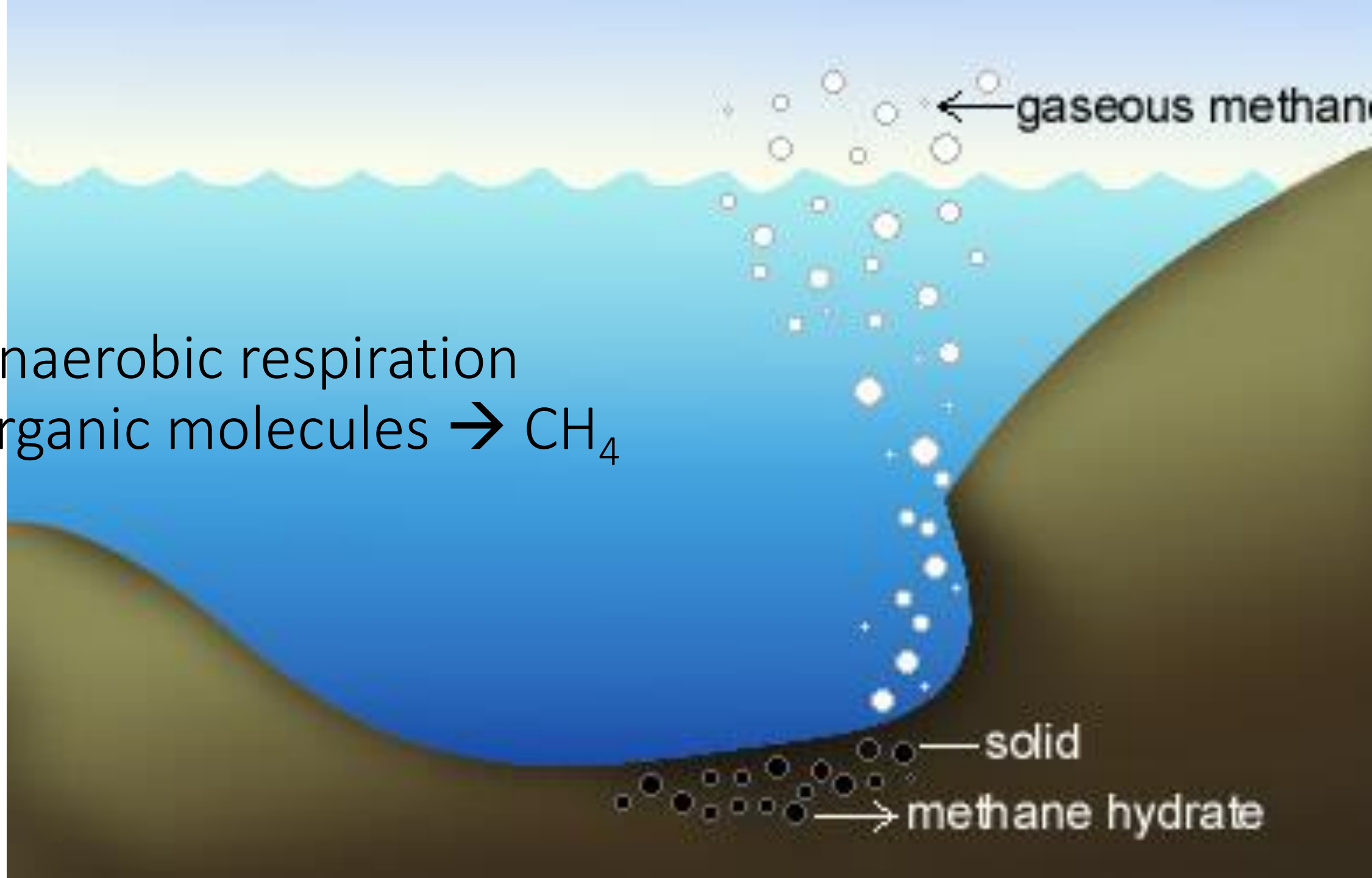
Combustion

Organic molecules  $\rightarrow$  CO<sub>2</sub>



Burning fossil fuels → CO<sub>2</sub>

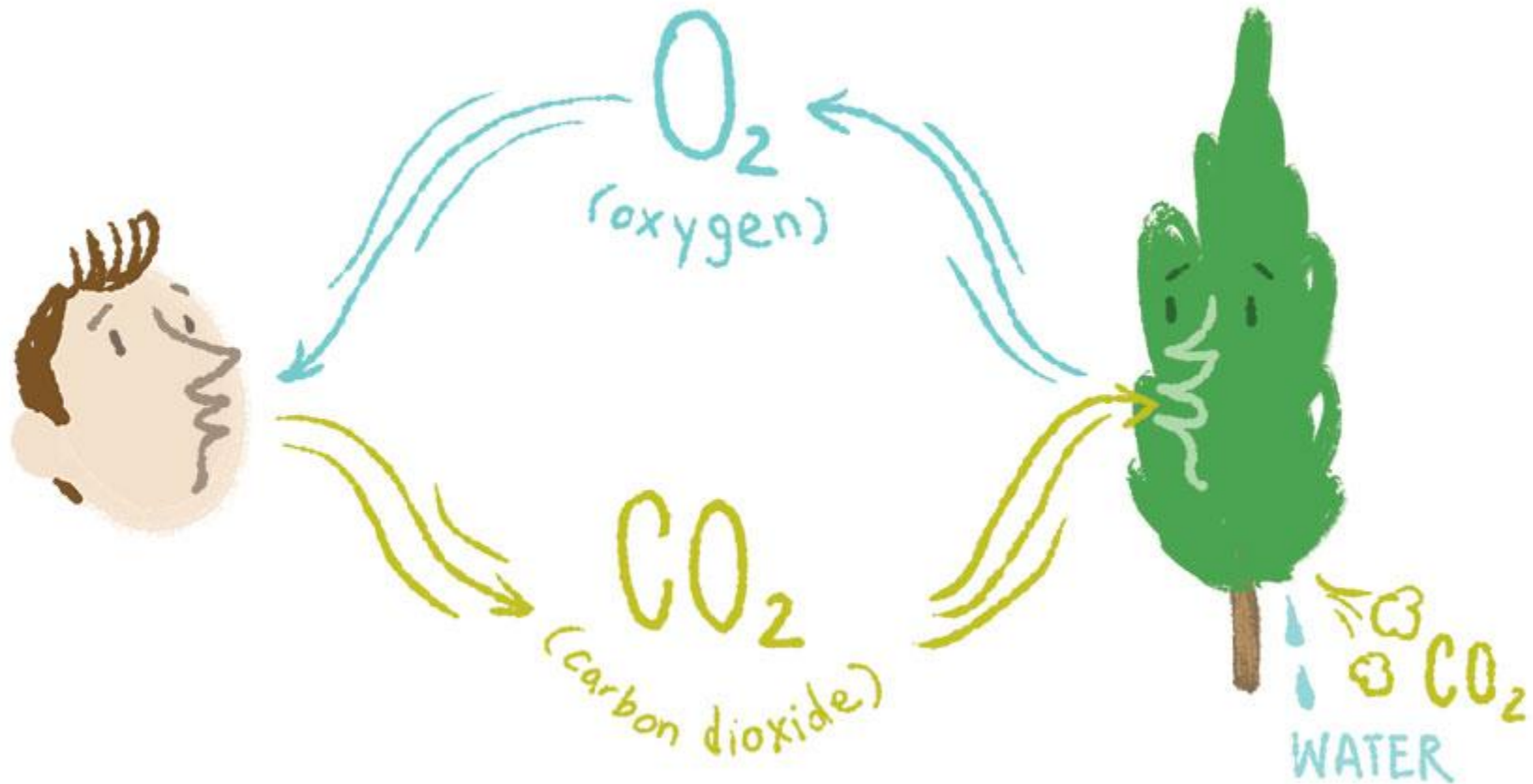
Anaerobic respiration  
organic molecules  $\rightarrow$   $\text{CH}_4$





# Aerobic Respiration

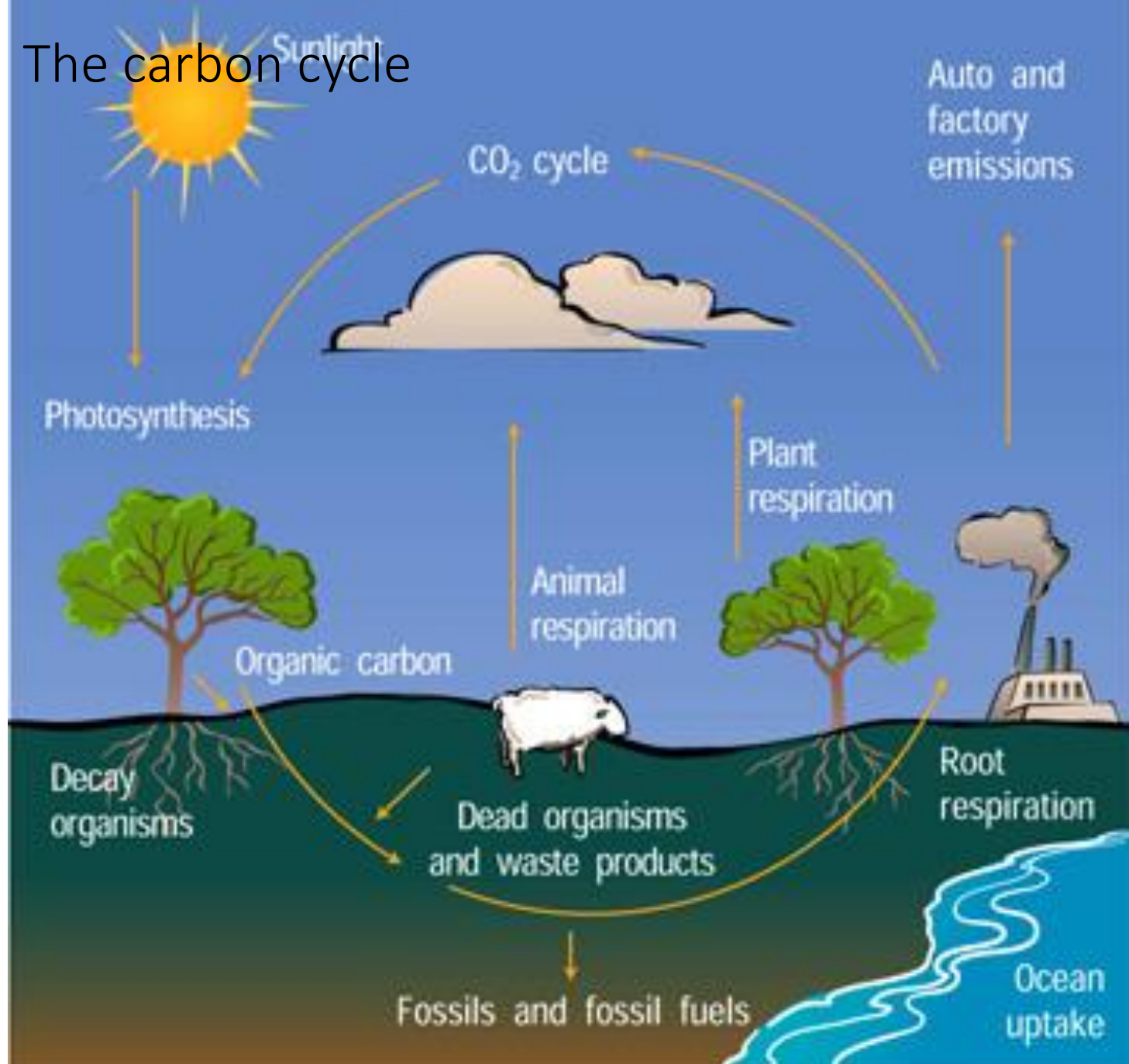
## Glucose to $\text{CO}_2$



Decomposition  
organic compounds  $\rightarrow$   $\text{CO}_2$



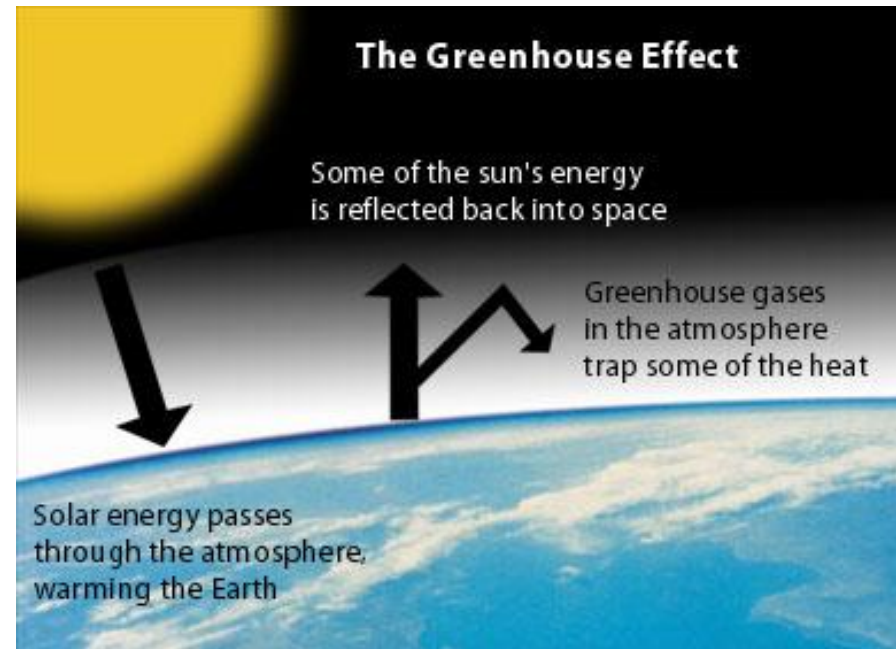
# The carbon cycle



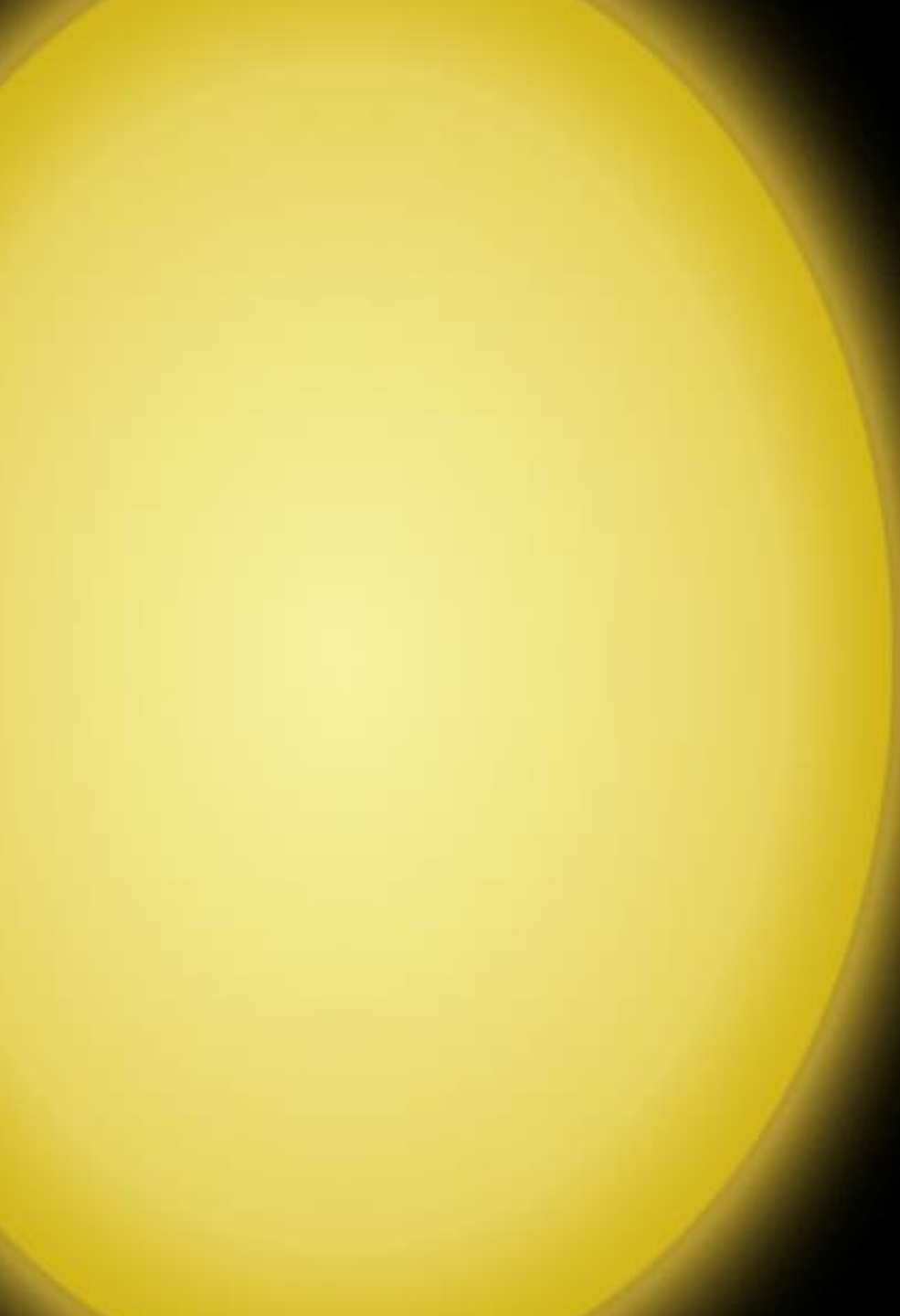
Human impacts on the Carbon cycle

$\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{H}_2\text{O}$ ,  $\text{NO}_x$  = greenhouse gases

- Gases that trap heat near surface of Earth

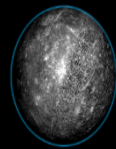


IS THE GREENHOUSE EFFECT GOOD  
OR BAD???



Mercury

333° F



Venus

855° F

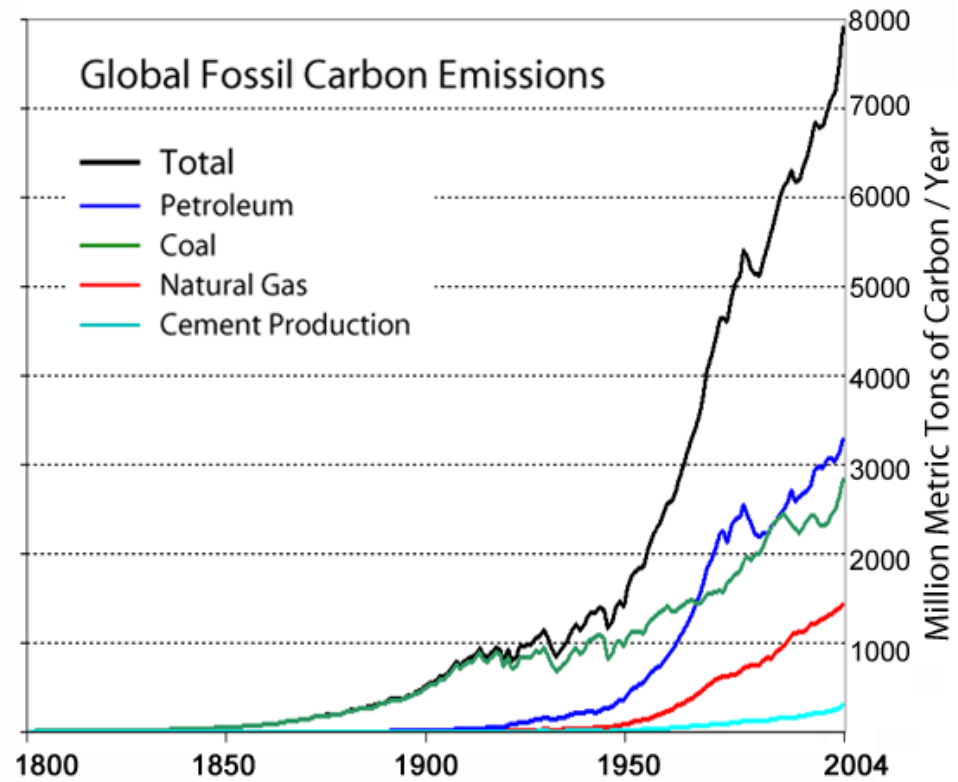


Earth

59° F



# Atmospheric CO<sub>2</sub>



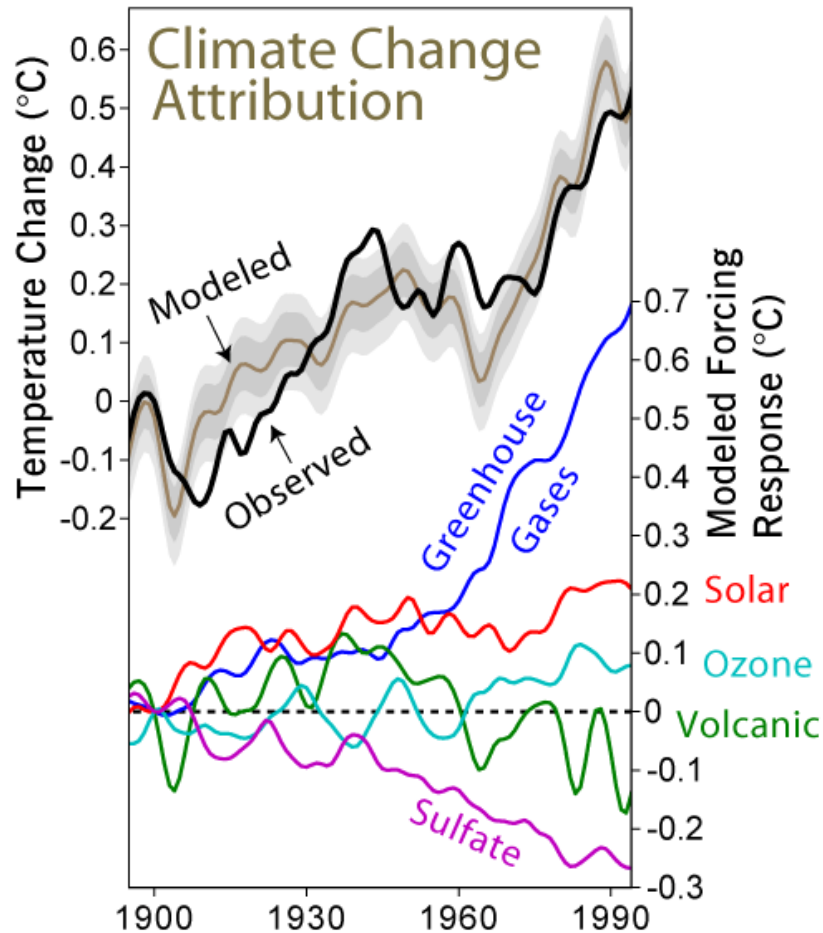


# Data analysis questions

There are 2 time periods when the emissions rose

- When did atmospheric carbon emissions first begin to rise?
- 1850
  
- When did the rate of carbon emissions go up steeply
- 1950
  
- What was happening in the world during those times in history that might have caused the increase?
- 1850s = industrial revolution burning coal
- 1950s = oil → gasoline for cars → increased transportation

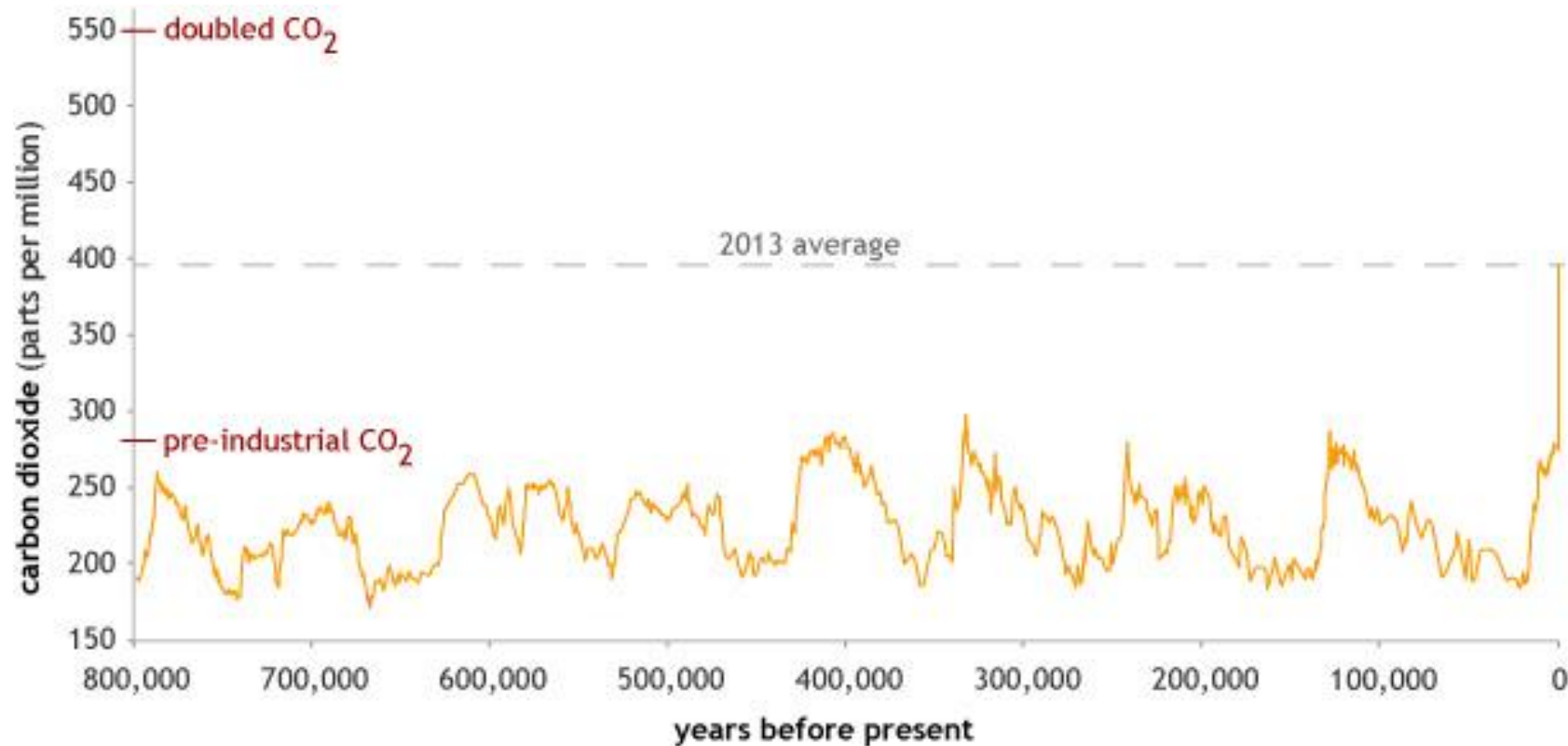
# Climate Forcings (things that impact climates)



- How much as climate changed from 1900 – 1990?
- Increased about 0.5°C
- What do sulfates and volcanos do to weather
- Decrease temperatures
- What do GHGs do to climate?
- Increase temperatures

# Atmospheric CO<sub>2</sub> levels

- Pre-industrial =
- 280 ppm

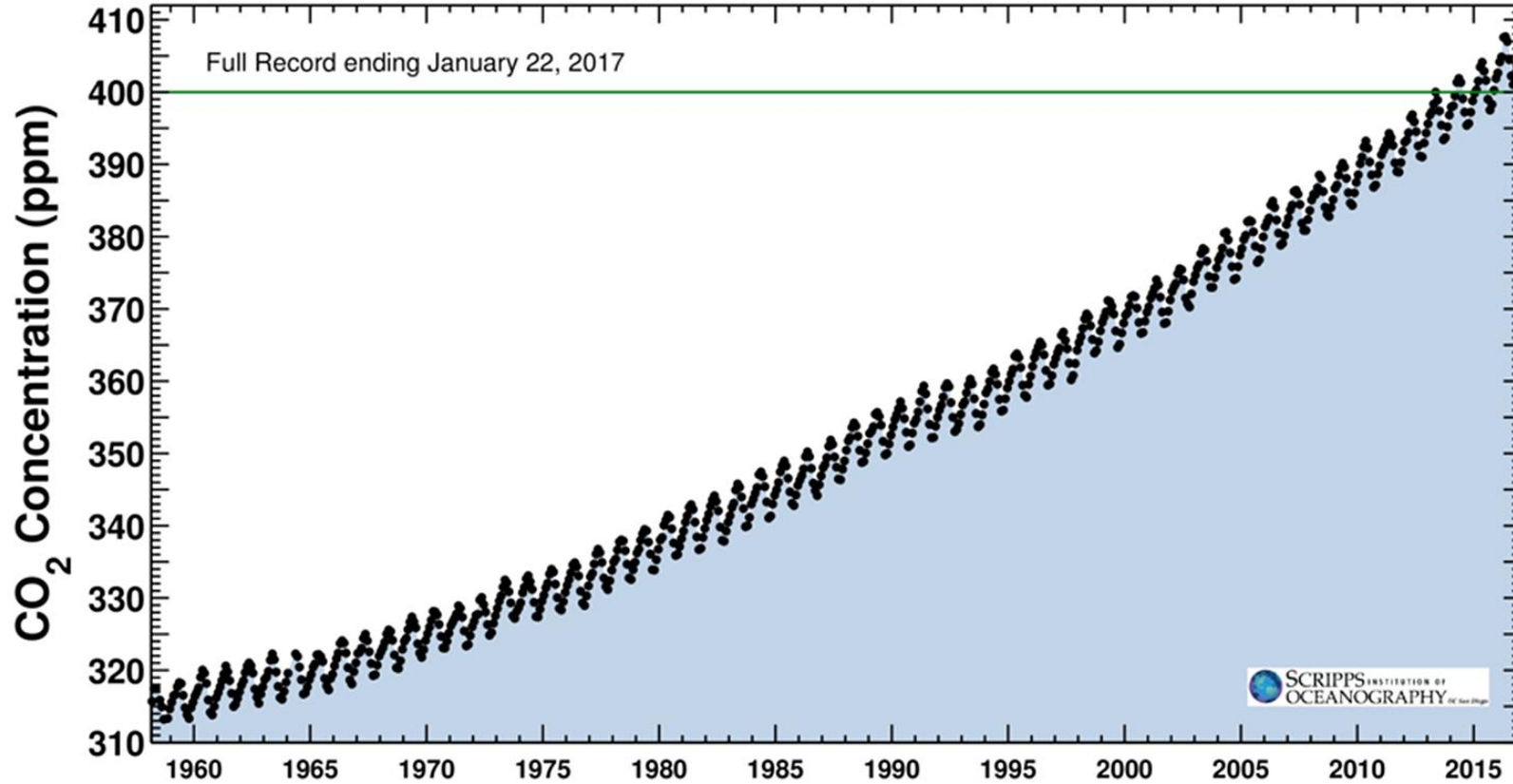


# Atmospheric CO<sub>2</sub> levels today

Latest CO<sub>2</sub> reading  
January 22, 2017

406.58 ppm

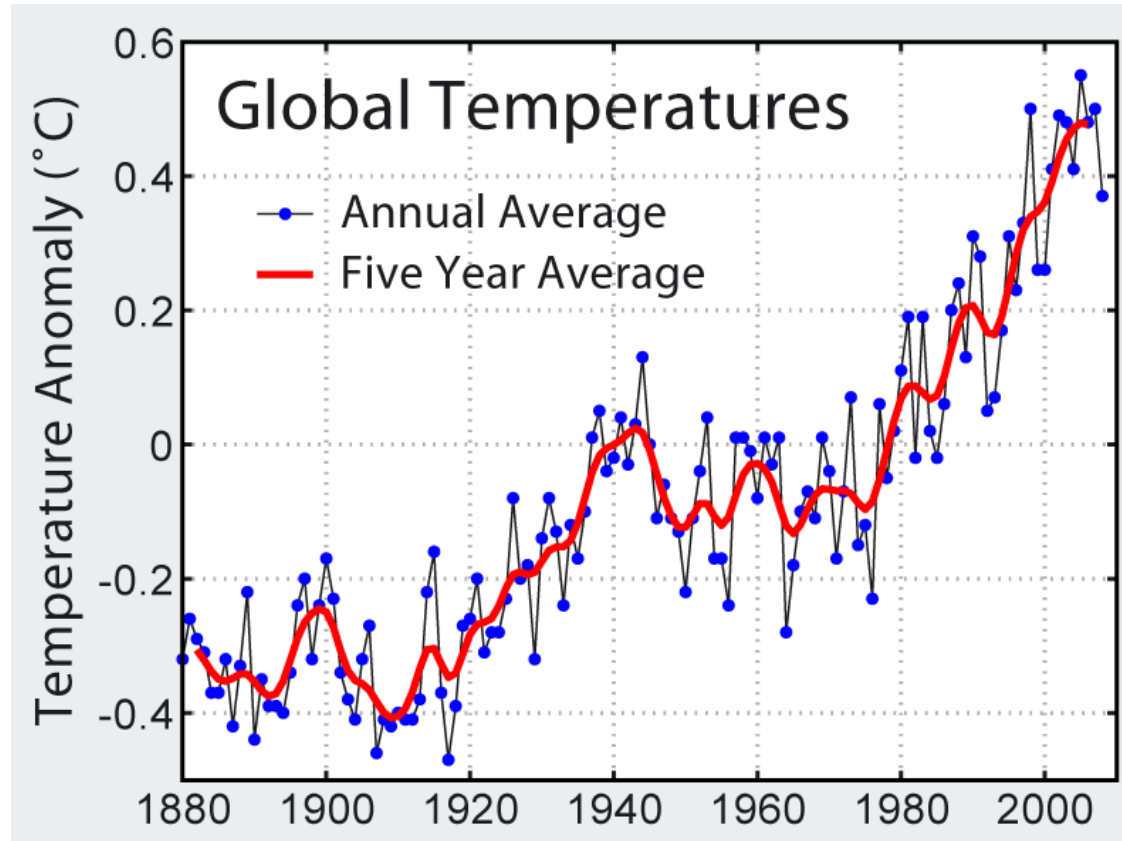
Carbon dioxide concentration at Mauna Loa Observatory



# Why??????

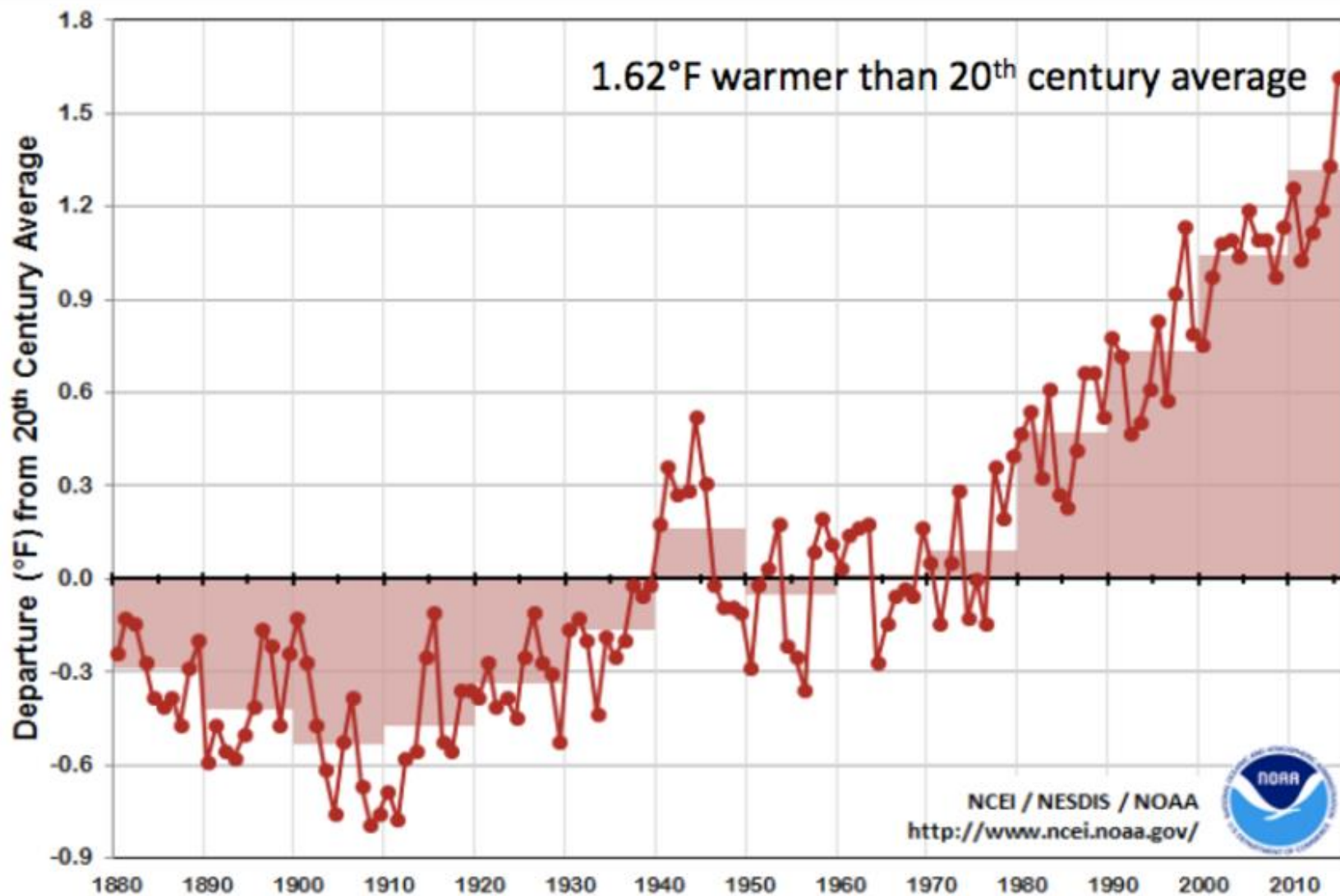
- Burning fossil fuels
- Deforestation

2007 IPCC Data indicates a 0.74°C rise in global averages over the past century

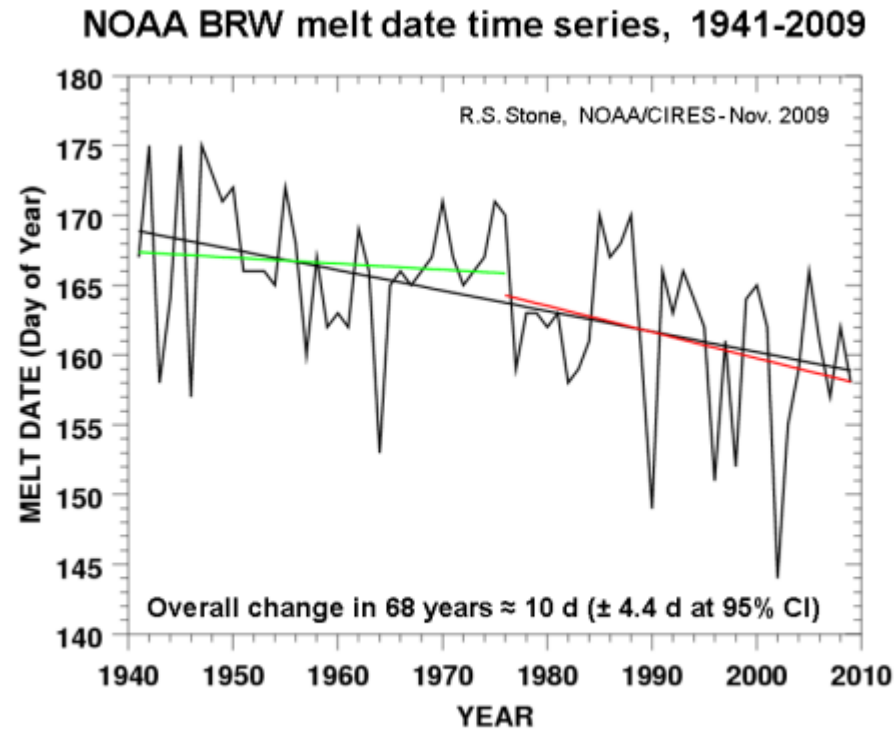


- This image shows the instrumental record of global average [temperatures](#) as compiled by the [NASA's Goddard Institute for Space Studies](#). The [data set](#) used follows the methodology outlined by Hansen et al. (2006). Following the common practice of the [Intergovernmental Panel on Climate Change](#), the zero on this figure is the mean temperature from 1961-1990.
- Image created by Robert A. Rohde.

# Global Temperature Time Series



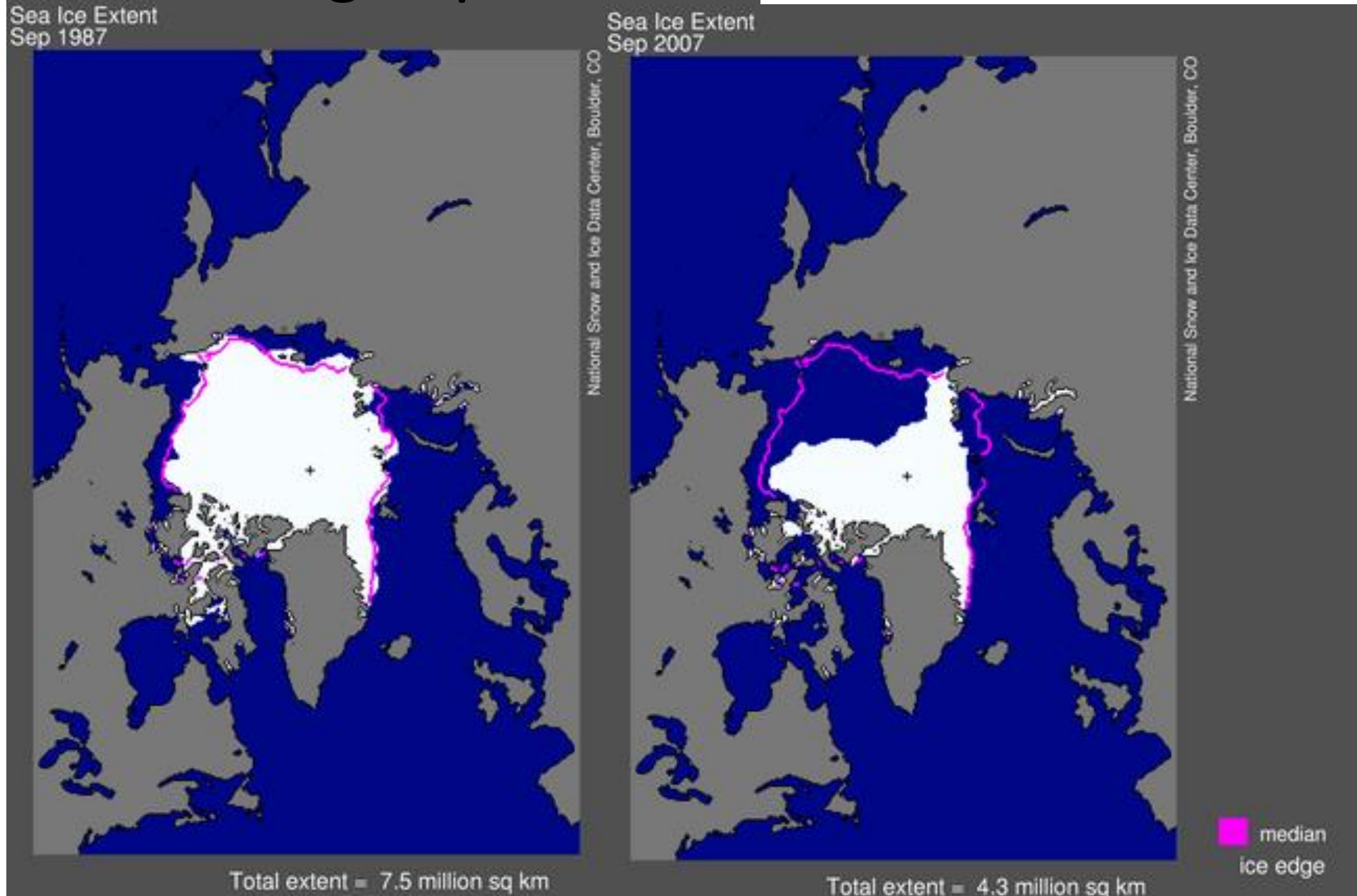
# Earlier spring snow melt in Barrow, Alaska



<http://www.esrl.noaa.gov/gmd/grad/snomelt.html>

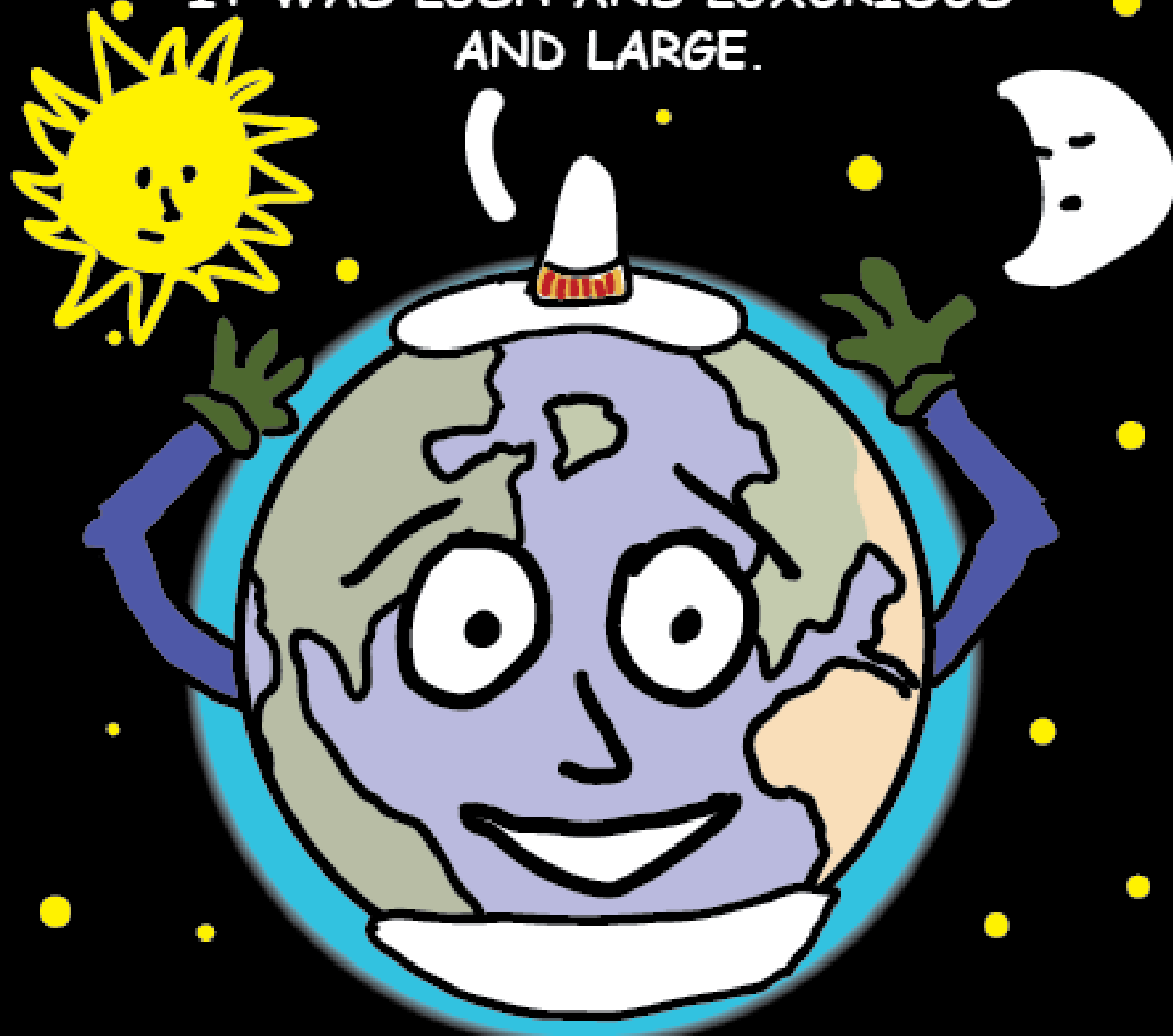


# Shrinking of polar ice sheets

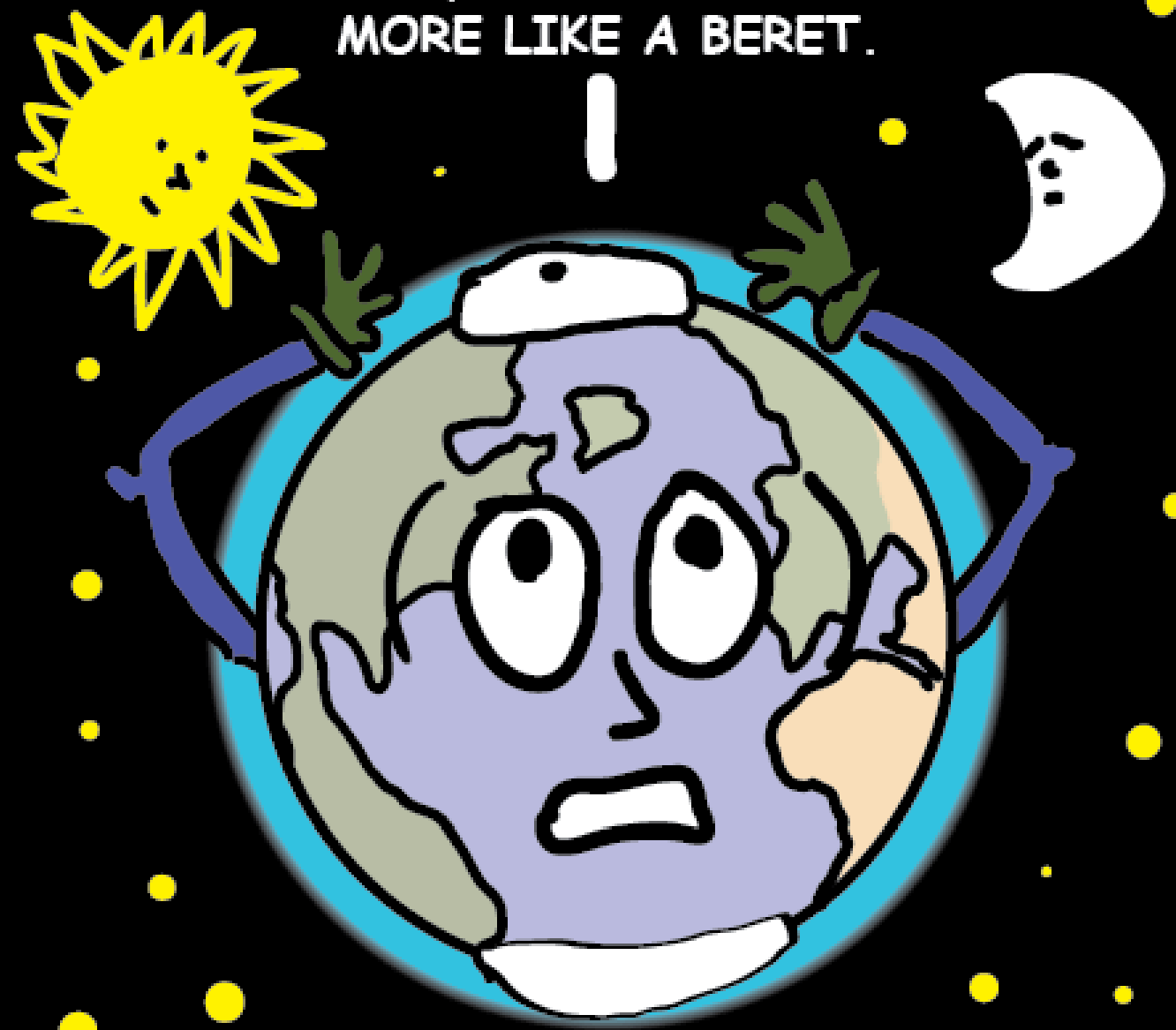


- If the total sea ice extent in 1987 was 7.5 million square km and the 2007 value was 4.3 million square km, how much sea ice has been lost within this time period? (show your math)
- 7.5 million =  $7.5 \times 10^6$
- 4.3 million =  $4.3 \times 10^6$
- Difference =  $3.2 \times 10^6 \text{ km}^2$

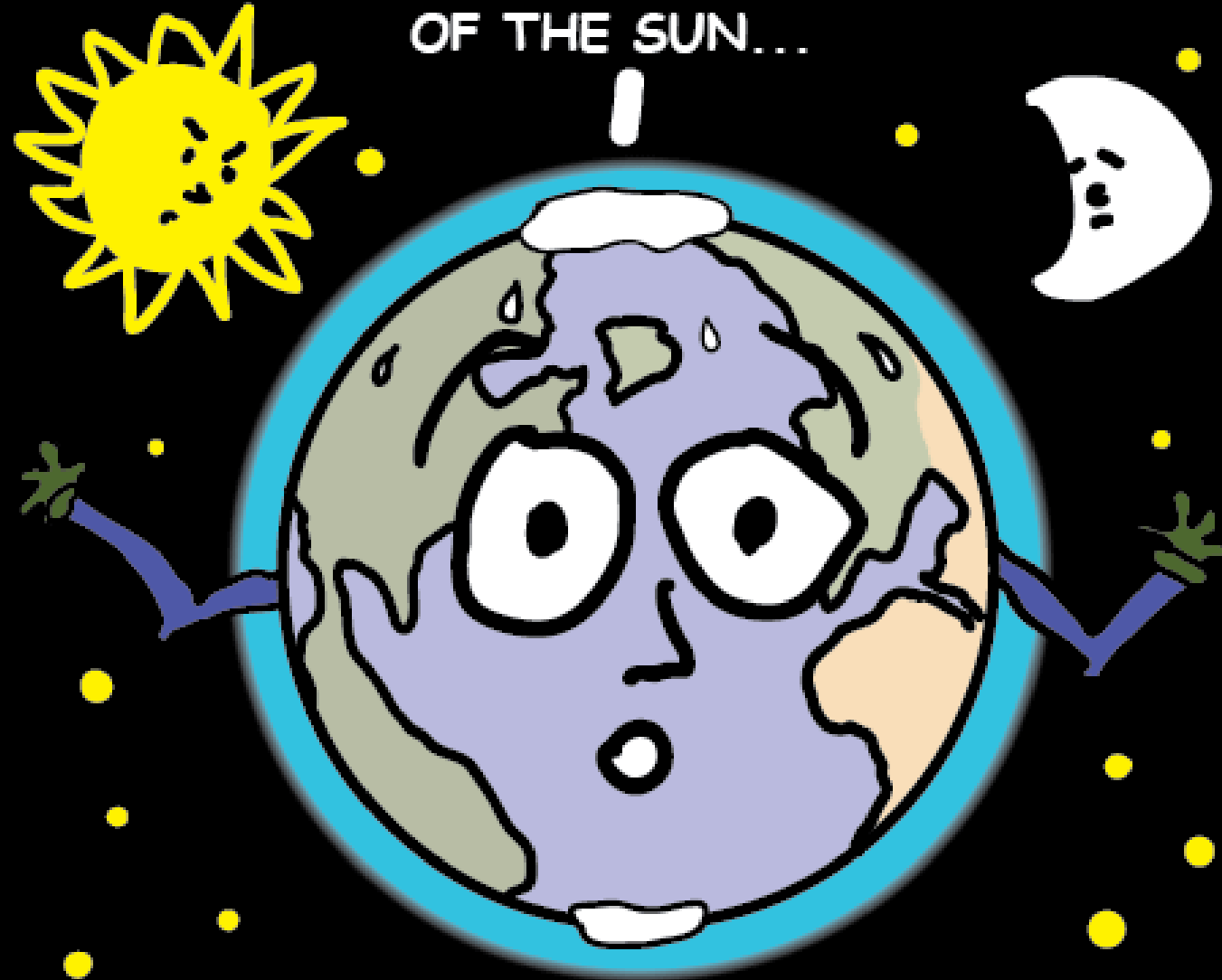
I USED TO HAVE A BEAUTIFUL SOMBRERO.  
IT WAS LUSH AND LUXURIOUS  
AND LARGE.



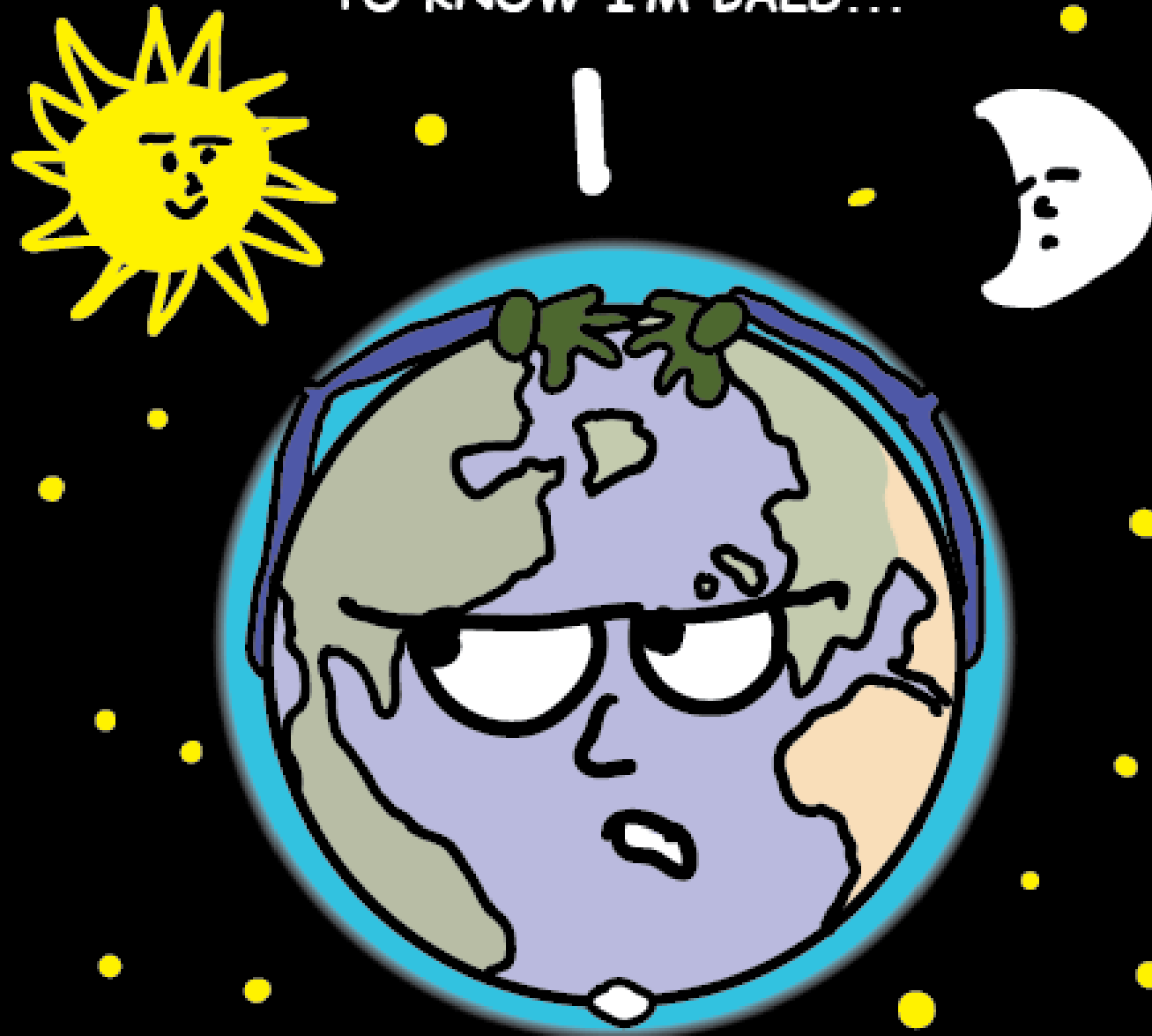
BUT LATELY, MY SOMBRERO SEEMS  
MORE LIKE A BERET.



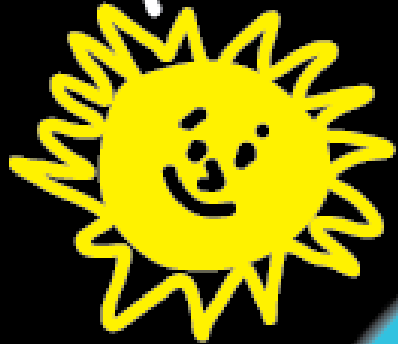
I FEAR MY HAT MAY SOON BE GONE,  
AND I'LL HAVE NOTHING TO PROTECT  
• MY HEAD FROM THE BEATING HEAT  
OF THE SUN...



...AND BESIDES... I DON'T WANT ANYONE  
TO KNOW I'M BALD...



HEY, BUDDY,  
YOUR UNDERWEAR'S  
GONE !!!



OH, MY!



Hey, guys!  
WE don't think  
that's so  
funny!

# Why??????

- Burning fossil fuels
- Deforestation



Humans have a greater impact on ecosystems than any other organism due to their ability to alter their environment

