Food Processing Program

Contemporary International Issues (FTP 217)

First Term 2025/2026

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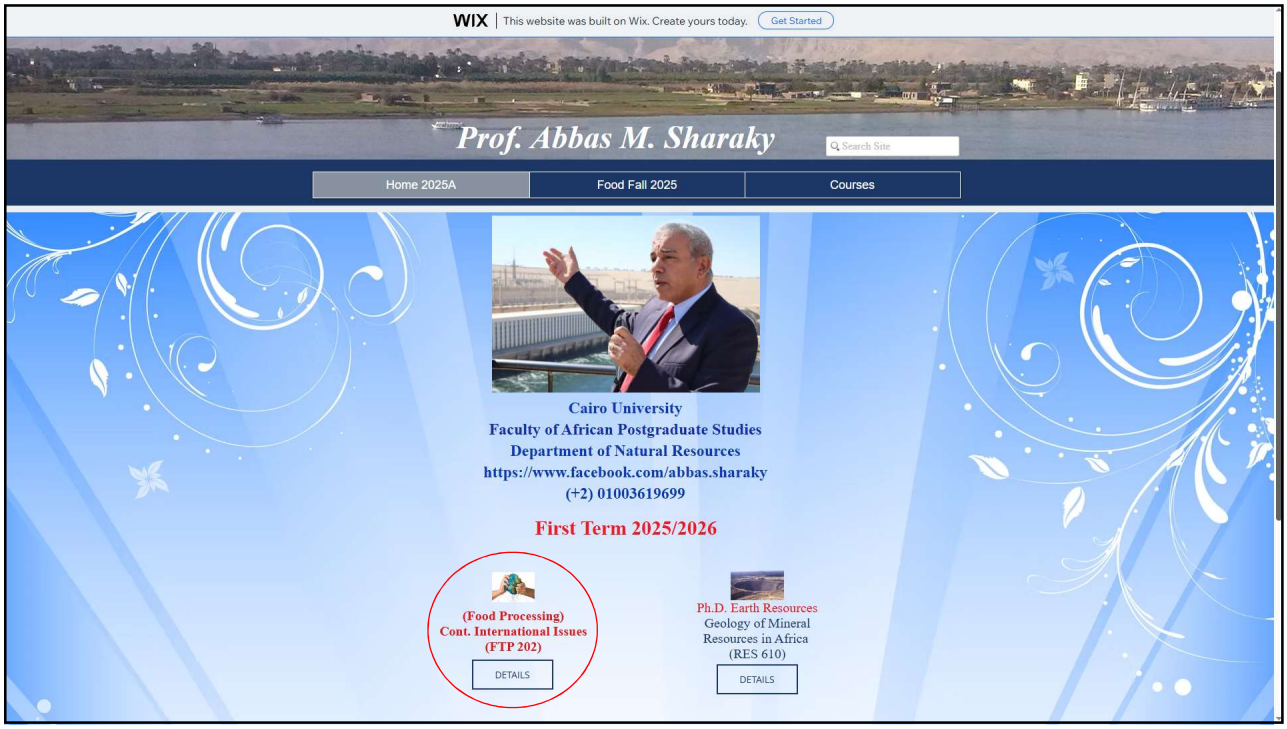
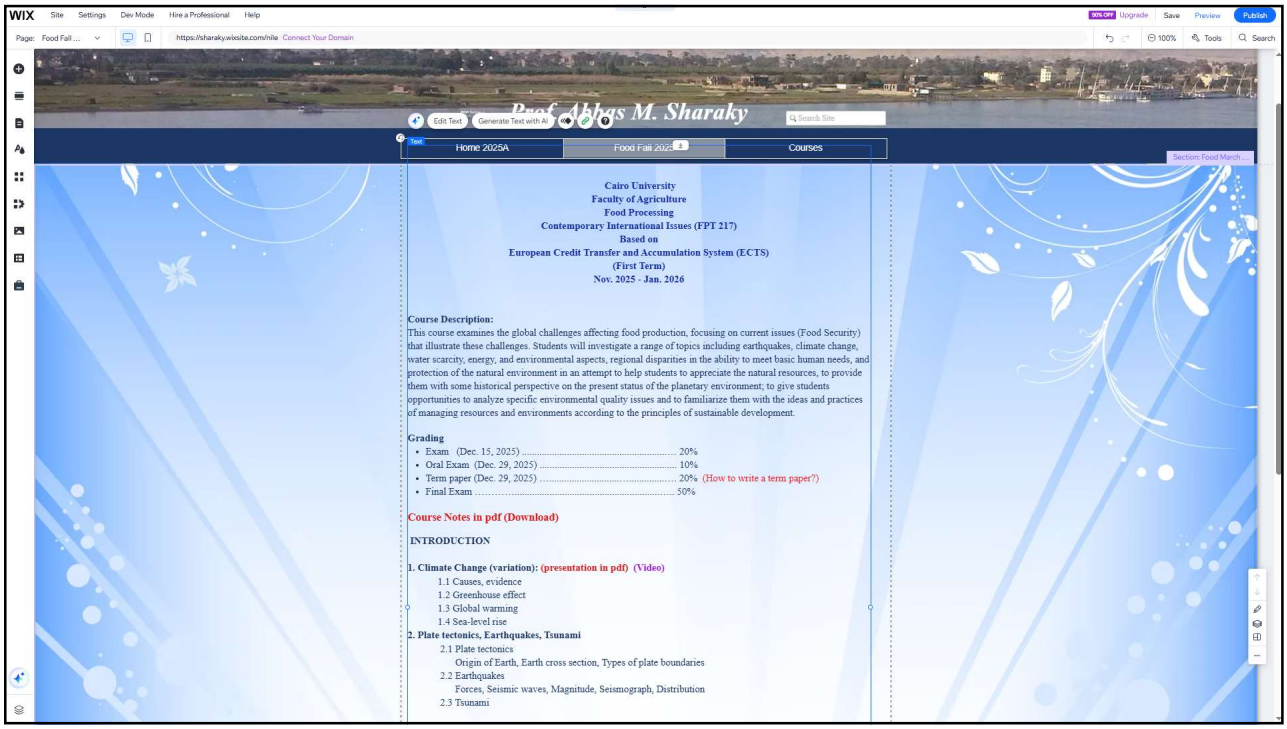




Grading

Mid Term Exam (Dec. 15, 2025) …….. 20%

Oral Exam (Dec. 29 , 2025) ……. 10%

Term paper (Dec. 29 , 2025)…… 20%

Final Exam …… 50%

Significant Environmental Issues

1. Climate Change
2. Global Warming
3. Plate tectonics
4. Earthquakes
5. Water Scarcity
6. Pollution
7. Desertification
8. Energy Scarcity
9. Volcanic hazards
10. Mass Wasting
11. Diseases
12. Overpopulation

Course Syllabus

1. Climate Change:
   Causes, evidences, greenhouse gases, sea level rise.
2. Plate tectonics and earthquakes
   1.1 Plates and Plate Motion
   2.1 Causes of Earthquakes and Seismic Waves
3. Water Issues:
   3.1 Water cycle and global water balance
   3.2 Water scarcity
   3.3 Water pollution
   3.4 Water resources in Africa
   3.5 Water resources in the Arab World
   3.6 Water scarcity
   3.7 Water resources in Egypt, Nile, High Dam
4. Transboundary issues in the Nile Basin:
   4.1 Water challenges in Ethiopia
   4.2 Ethiopian Renaissance Dam
   4.3 Water Agreements
5. Pollution
6. Desertification issues:
   5.1 Drought, deforestation, overgrazing, urbanization.
   5.2 Sand dune encroachment.
7. Energy Resources issues:
   6.1 Non-renewable energy resources (fossil oil, natural gas, coal, uranium).
   6.2 Renewable energy resources (solar, wind, geothermal, hydroelectricity, biomass, biofuels, nuclear power).

Climate Change

UN CLIMATE CHANGE CONFERENCE (UNFCCC)

Conference of the Parties (COP)

COP27: Sharm El-Sheikh, Egypt (Africa) 2022
COP28: Dubai, UAE, (Asia) 2023
COP29: Baku, Azerbaijan, (E. Europe & W. Asia) 2024
COP30: Belém, Brazil, (S. America) 2025

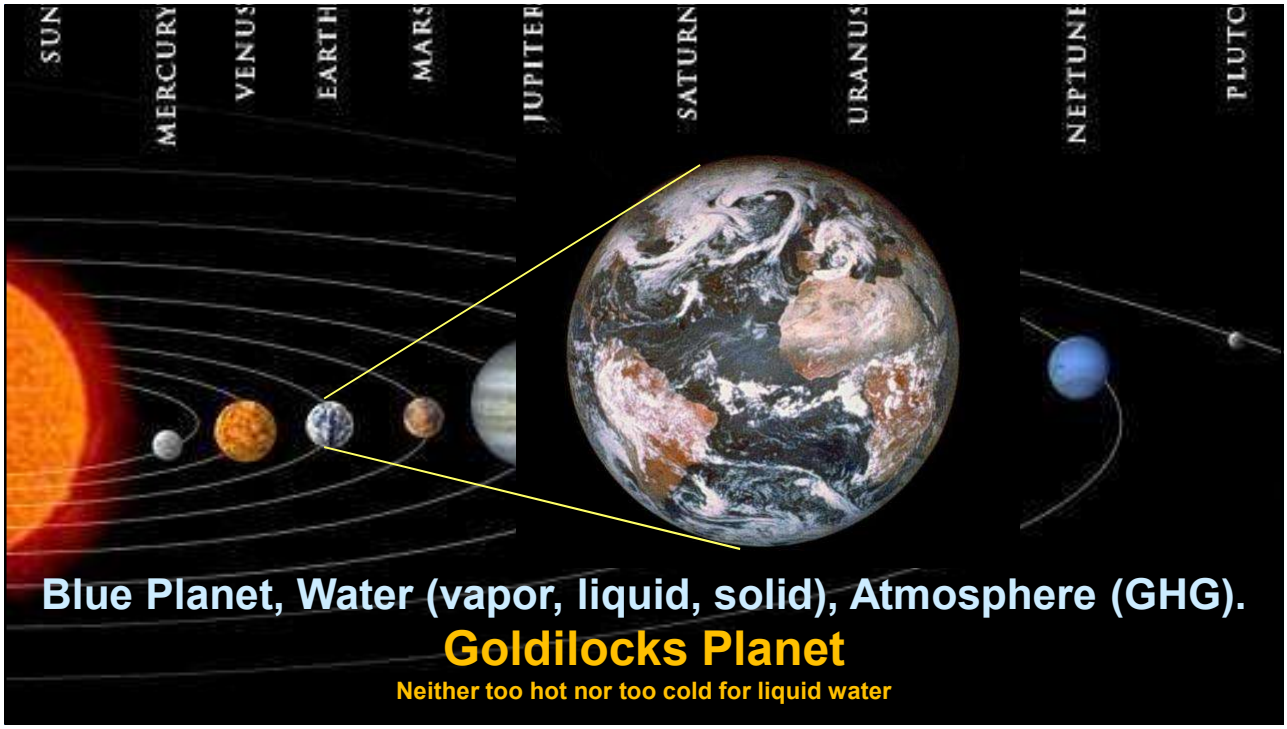
Climate Change
Variation, Fluctuation, Oscillation

- **Climate** is the average of weather over long many years (~30 years)
- **Weather** is the changes of the climatic elements in the atmosphere over a short period of time (minutes to months).

Climate is what you expect
weather is what you get.

- **Climate Change**

It is a shift in those average conditions over decades to millions of years.



Blue Planet, Water (vapor, liquid, solid), Atmosphere (GHG).

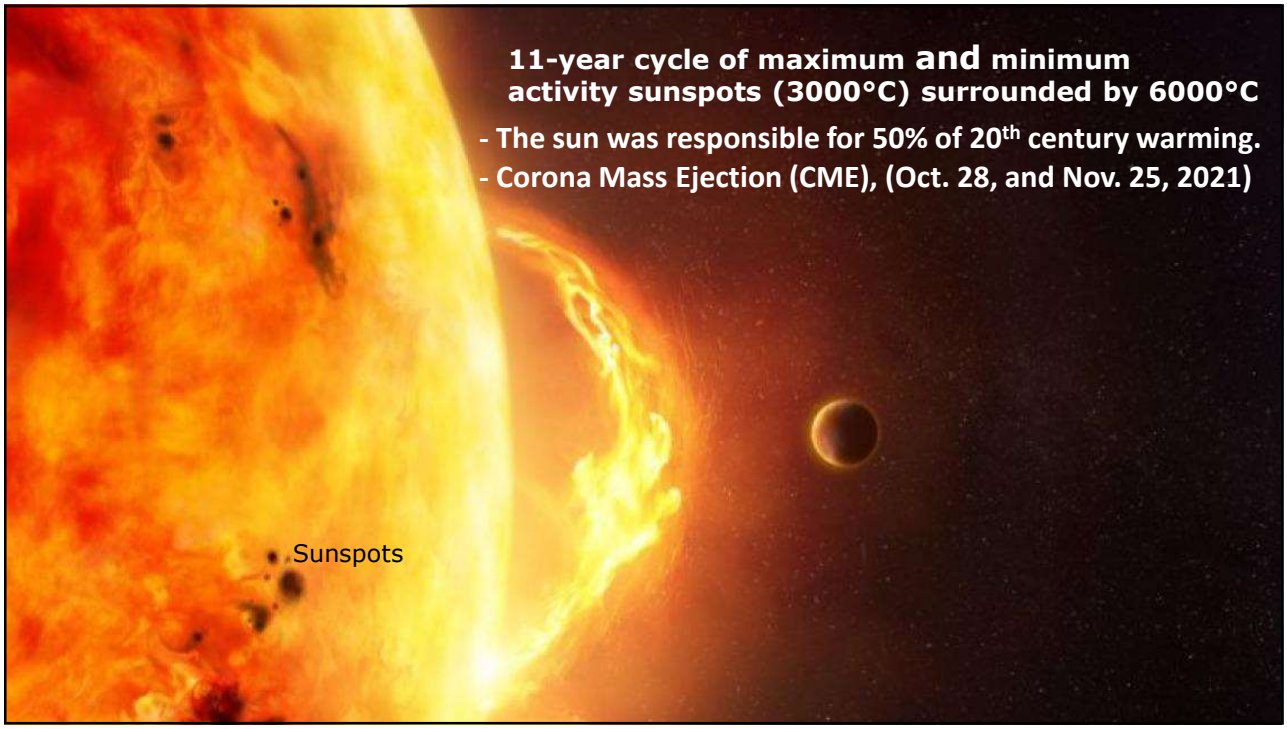
Goldilocks Planet

Neither too hot nor too cold for liquid water

Natural Causes of Climate Change

Outer Factors

- Strength of the Sun
  - The energy output of the Sun is not constant:
  - it varies over time and this has an impact on climate.


11-year cycle of maximum and minimum activity sunspots (3000°C) surrounded by 6000°C
- The sun was responsible for 50% of 20th century warming.
- Corona Mass Ejection (CME), (Oct. 28, and Nov. 25, 2021)
Sunspots

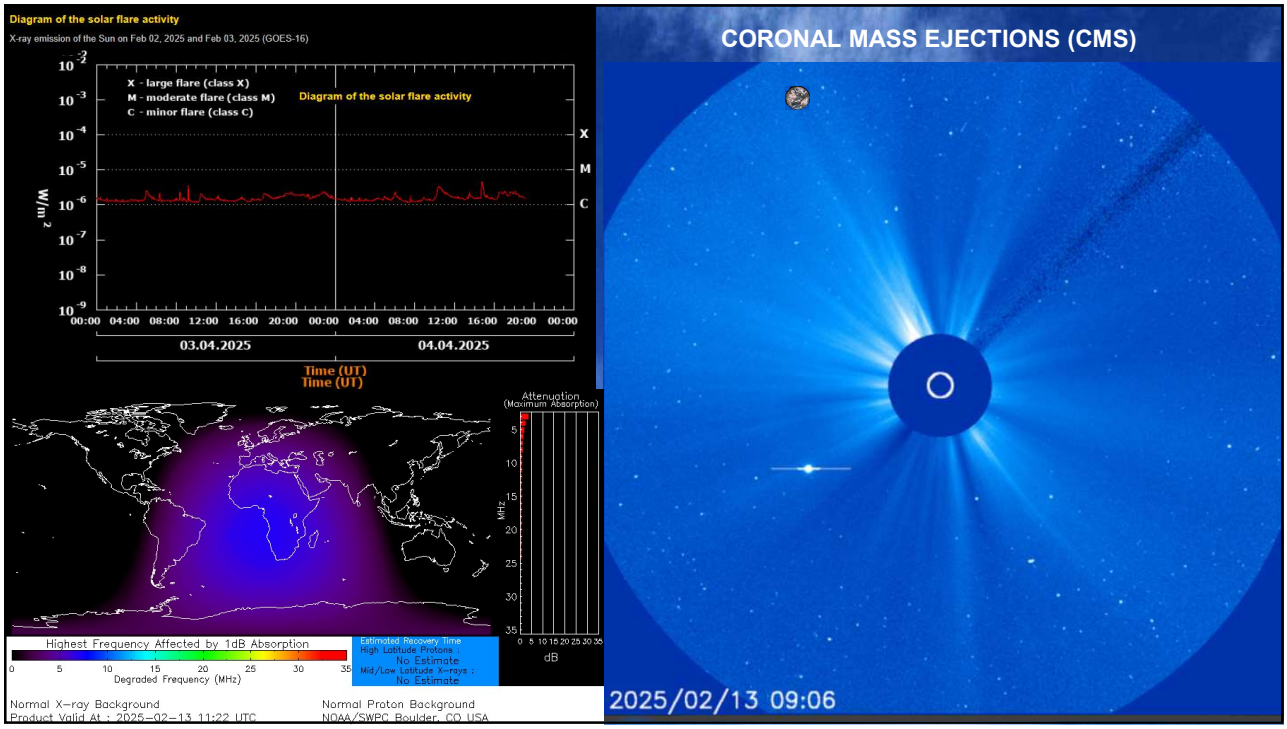
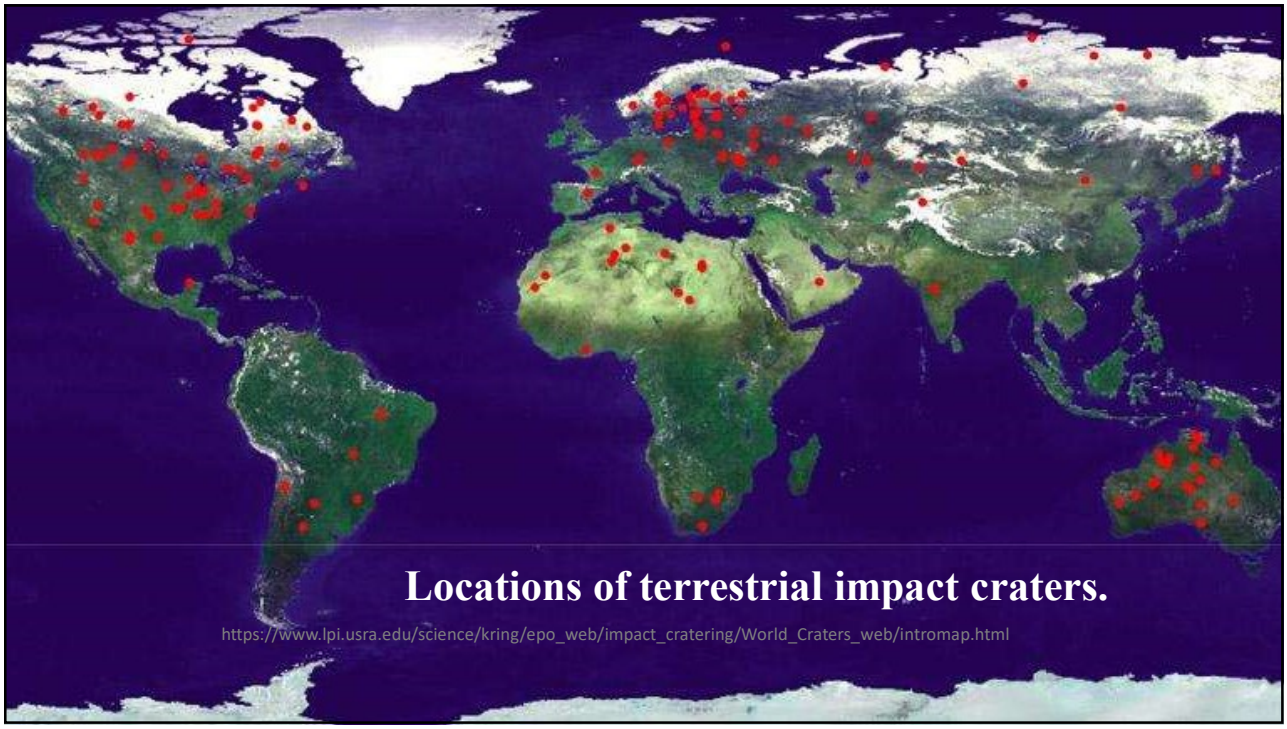


Diagram of the solar flare activity
X-ray emission of the Sun on Feb 02, 2025 and Feb 03, 2025 (GOES-16)
X - large flare (class X)
M - moderate flare (class M)
C - minor flare (class C)
Diagram of the solar flare activity
W/m²
03.04.2025
04.04.2025
Time (UT)
Attenuation (Maximum Absorption)
MHz
dB
Highest Frequency Affected by 1dB Absorption
Degraded Frequency (MHz)
Estimated Recovery Time
High Latitude Protons : No Estimate
Mid/Low Latitude X-rays : No Estimate
Normal X-ray Background
Normal Proton Background
NOAA/SWPC Boulder, CO USA
CORONAL MASS EJECTIONS (CMS)
2025/02/13 09:06

Natural Causes of Climate Change

Outer Factors

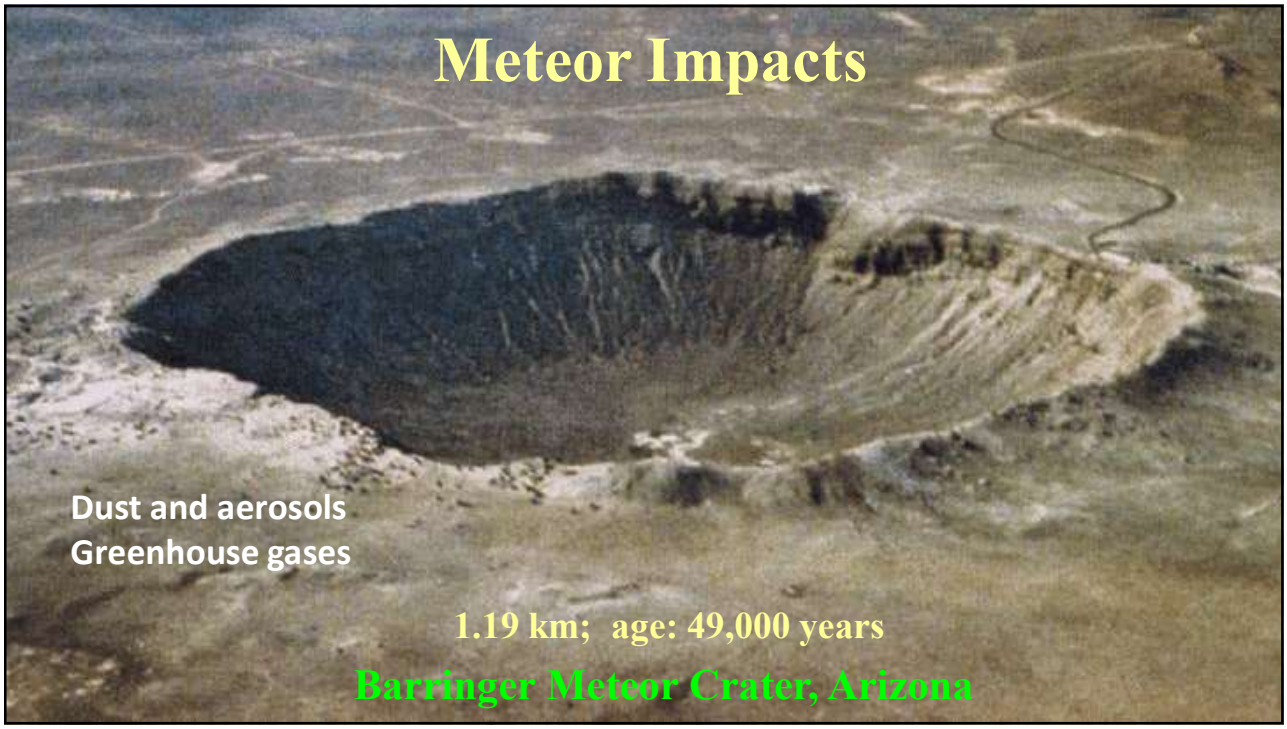
- Strength of the Sun
- Meteorite impact

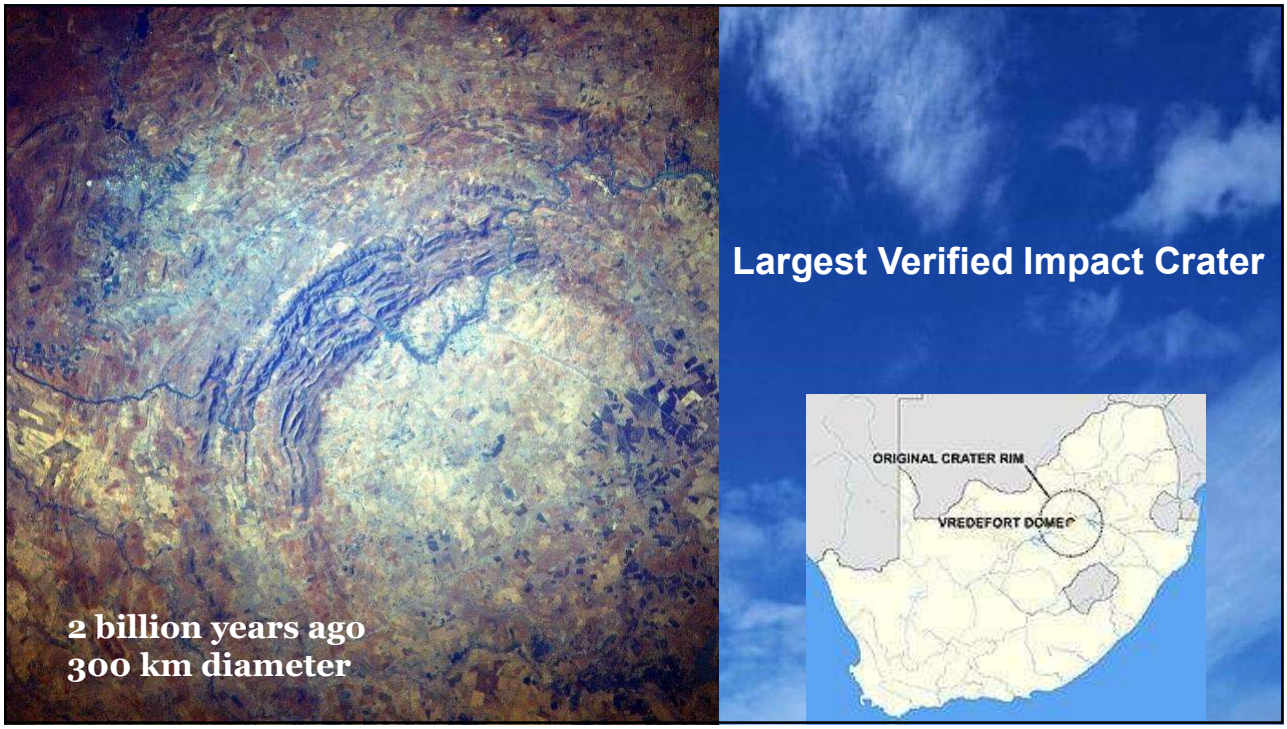


Locations of terrestrial impact craters.

https://www.lpi.usra.edu/science/kring/epo_web/impact_cratering/World_Craters_web/intromap.html

Meteor Impacts





Natural Causes of Climate Change

Meteorite impacts

Large impacts can cause a range of effects that include dust and aerosols being ejected high into the atmosphere that prevent sunlight from getting through and cause global temperatures to fall.

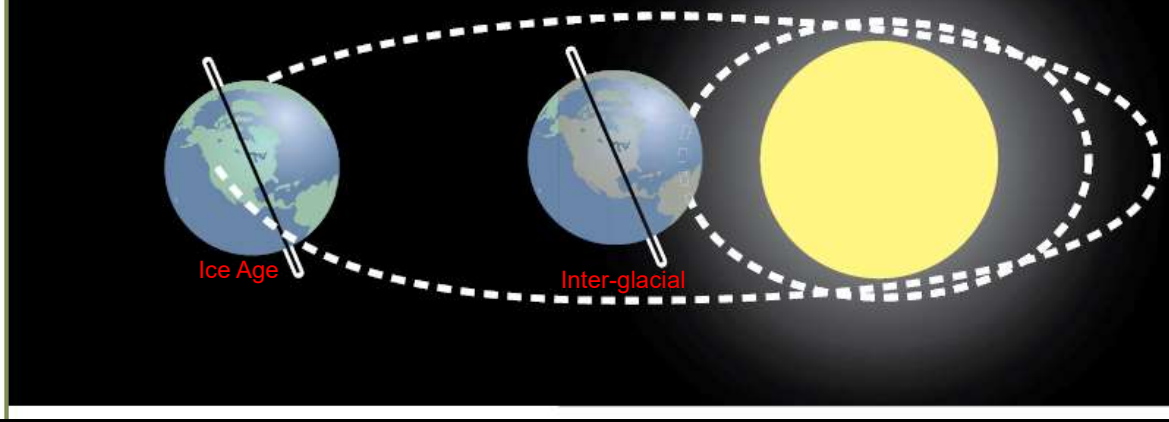
After the dust and aerosols fall back to Earth, the greenhouse gases (CO_2, water and methane), caused by the interaction of the impactor and its 'target rocks', remain in the atmosphere and can cause global temperatures to increase.

Natural Causes of Climate Change

Outer Factors
- Strength of the Sun
- Meteorite impact

Earth Factors
- Earth's orbit, rotation tilt
- Atmosphere
- Plate tectonics (Earthquakes and volcanics)
- Latitudes
- Altitude and albedo
- Water bodies (Ocean currents)
- Plant cover

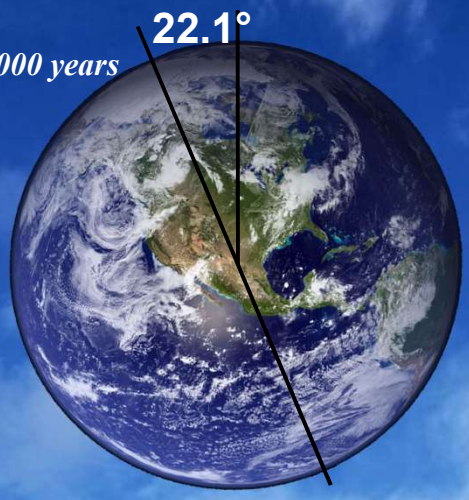
Natural Causes Eccentricity Cycle الاختلاف المركزى



Changes from a more circular route to a more elliptical one on cycle of about 90,000 to 100,000 years.

Natural Causes of Climate Change

Orientation of the Earth's axis of rotation (tilt) (precession)

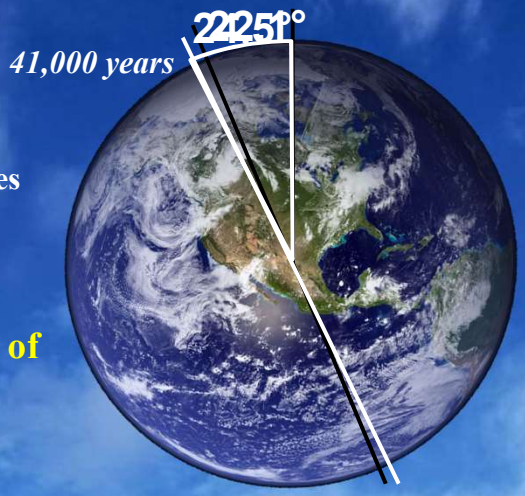


(23.5°) When the angle increases the summers become warmer and the winters become colder.

Earth also wobbles on its axis of rotation (precession)

Natural Causes of Climate Change

Orientation of the Earth's axis of rotation (tilt) (precession)



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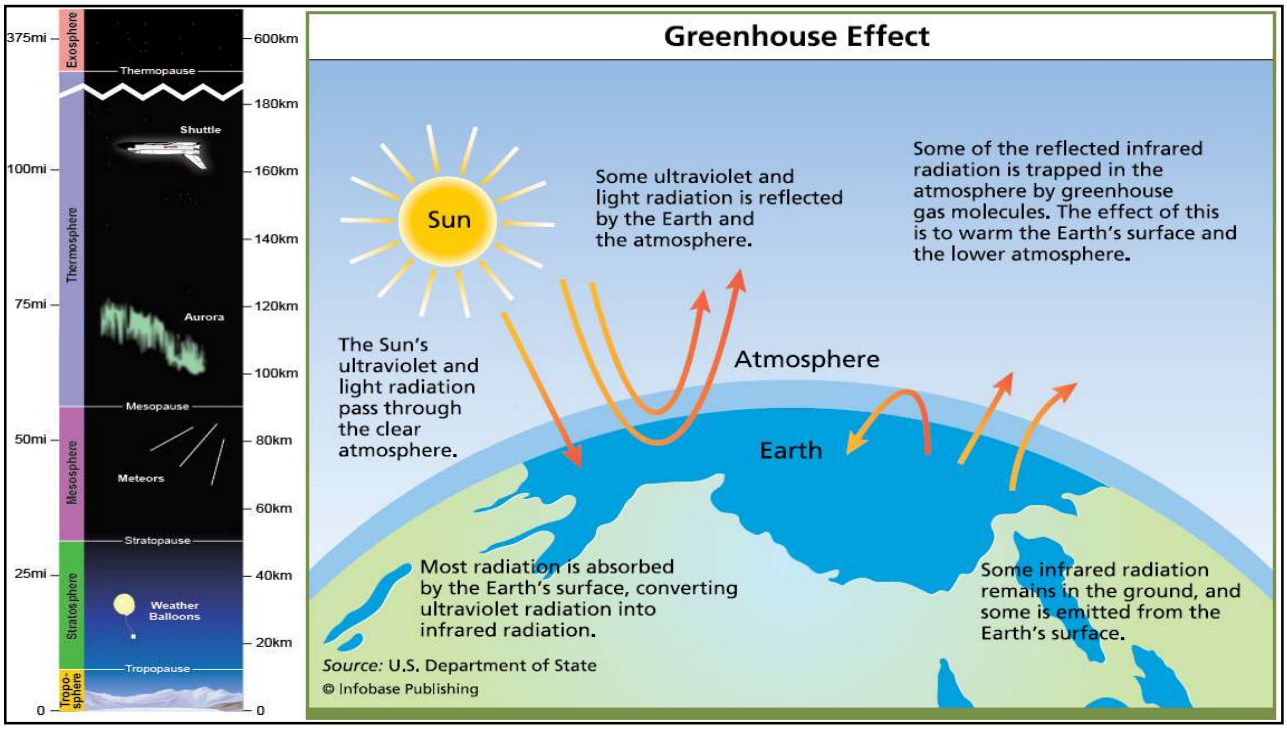

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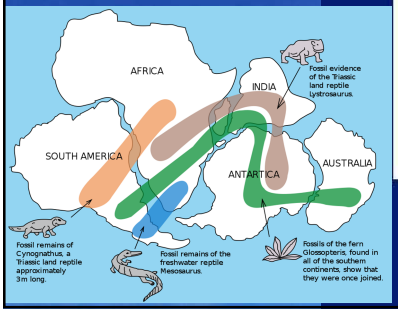
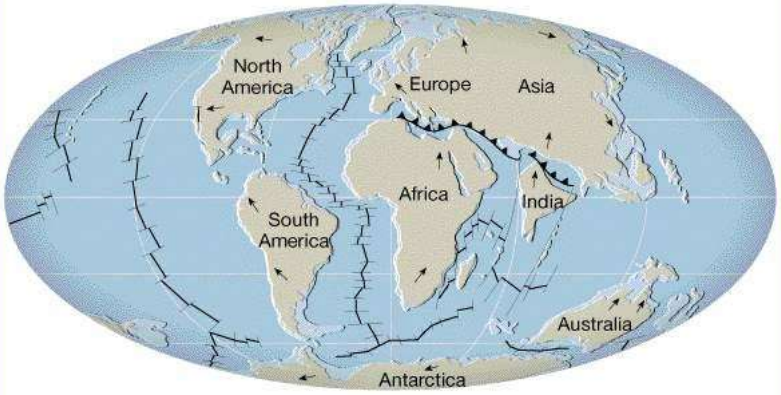
Global circulation patterns of air and ocean water.

Northern Hemisphere has warmed more than the Southern Hemisphere.

Location of coal mines



Climate Change through Paleocene-Eocene

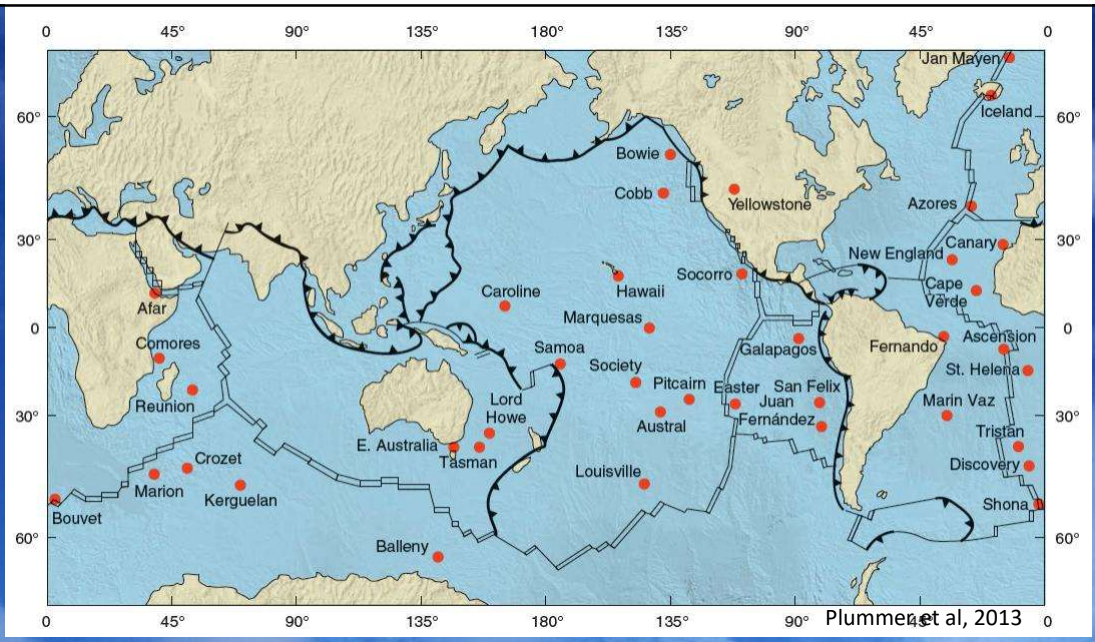


D. 50 Million Years Ago (Early Cenozoic)

Paleocene-Eocene Thermal Maximum (PETM) – No ice

Convergent - Divergent -Transform

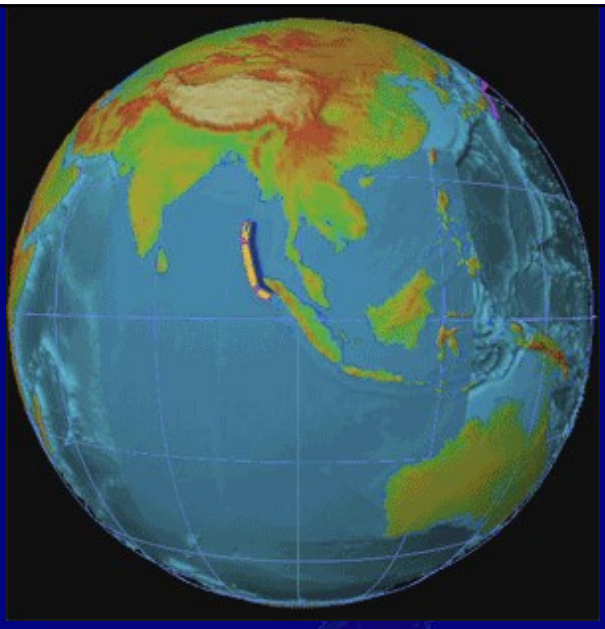
Break Up of Pangea



Plummer et al, 2013

Distribution of hot spots, identified by volcanic activity and structural uplift within the past few million years.

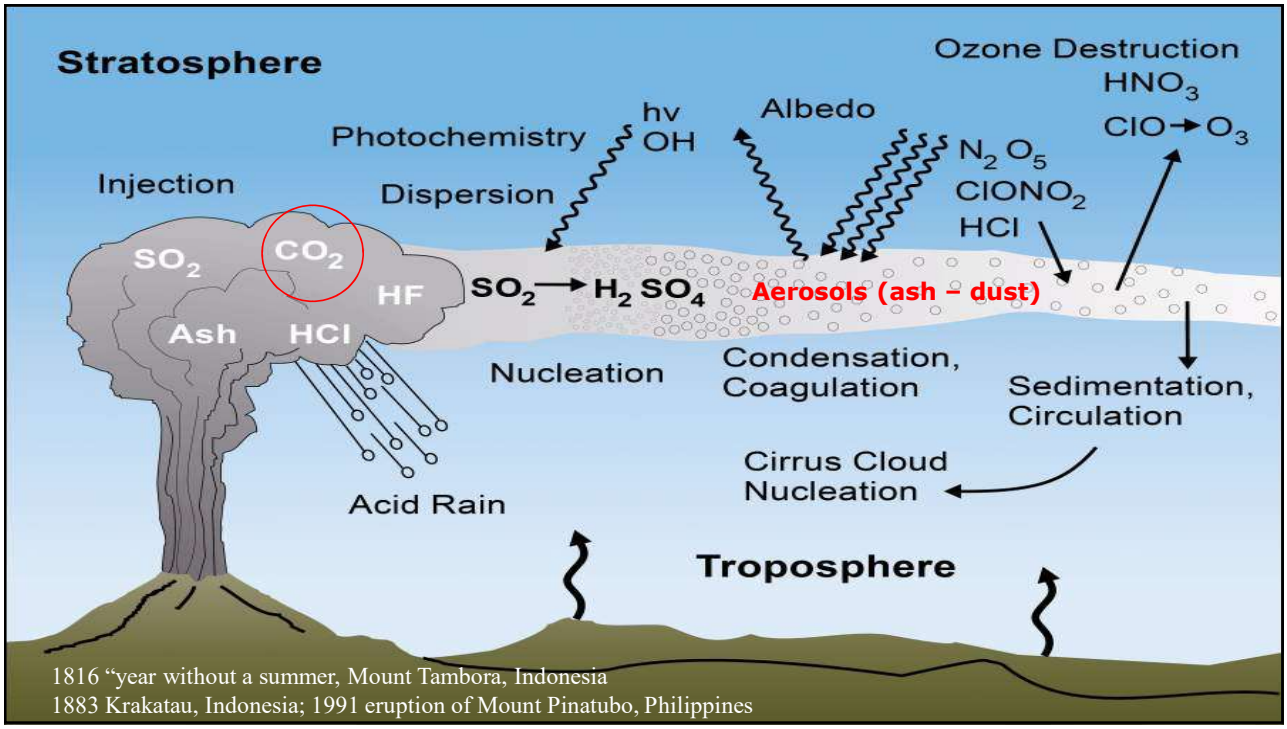
283,000 deaths



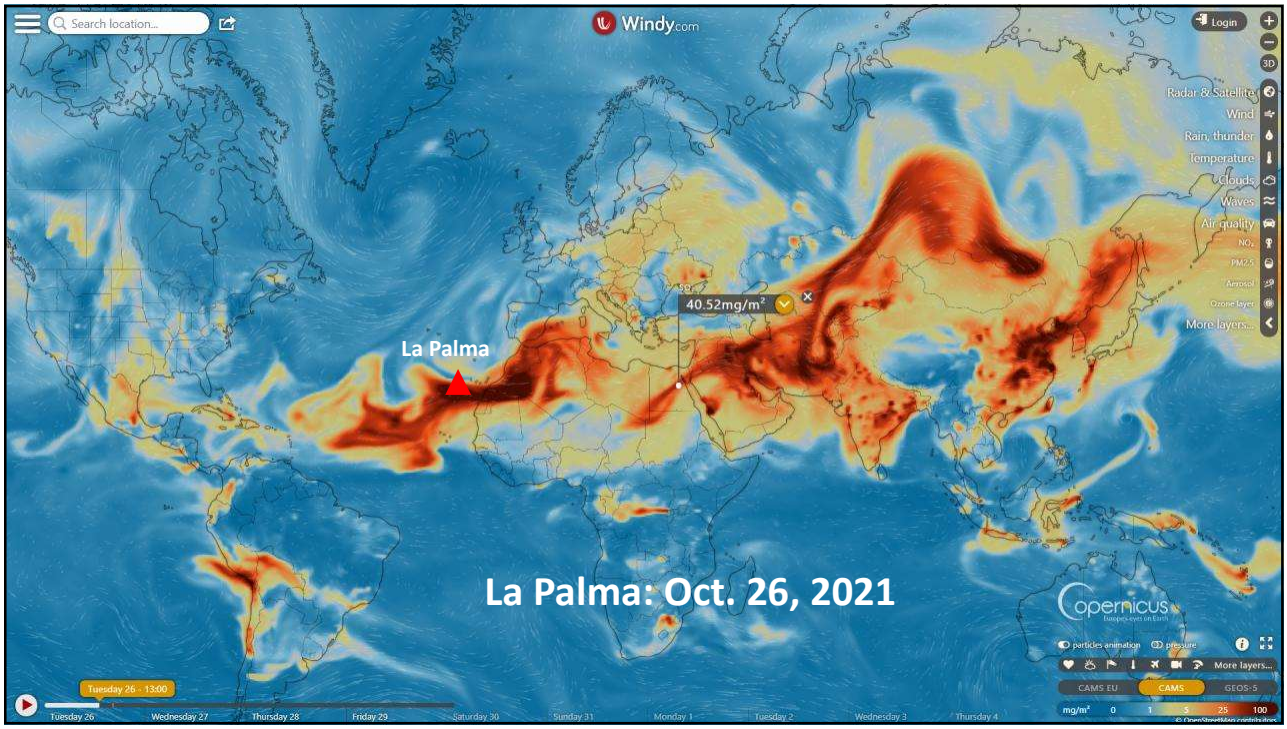
Dec. 26, 2004

Sumatra- Andaman earthquake (9.0 to 9.3).

largest seismic event on Earth in more than 50 years



1816 "year without a summer, Mount Tambora, Indonesia
1883 Krakatau, Indonesia; 1991 eruption of Mount Pinatubo, Philippines



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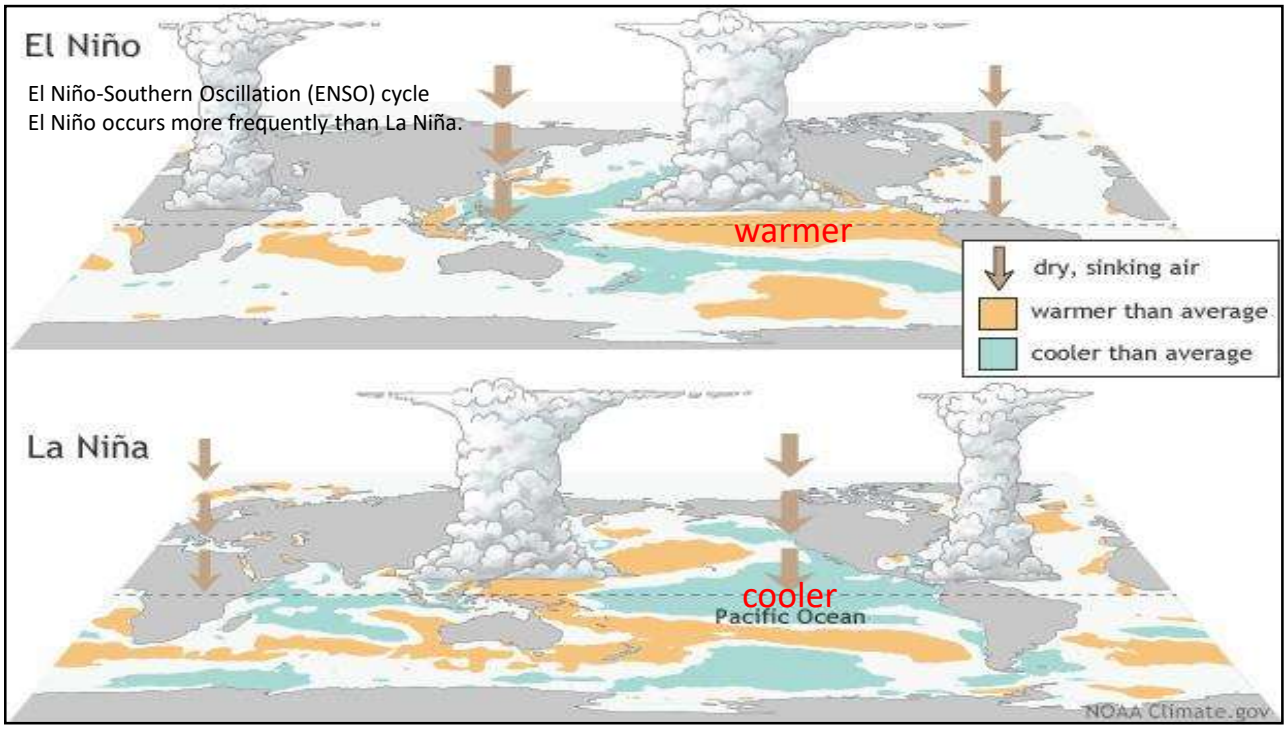
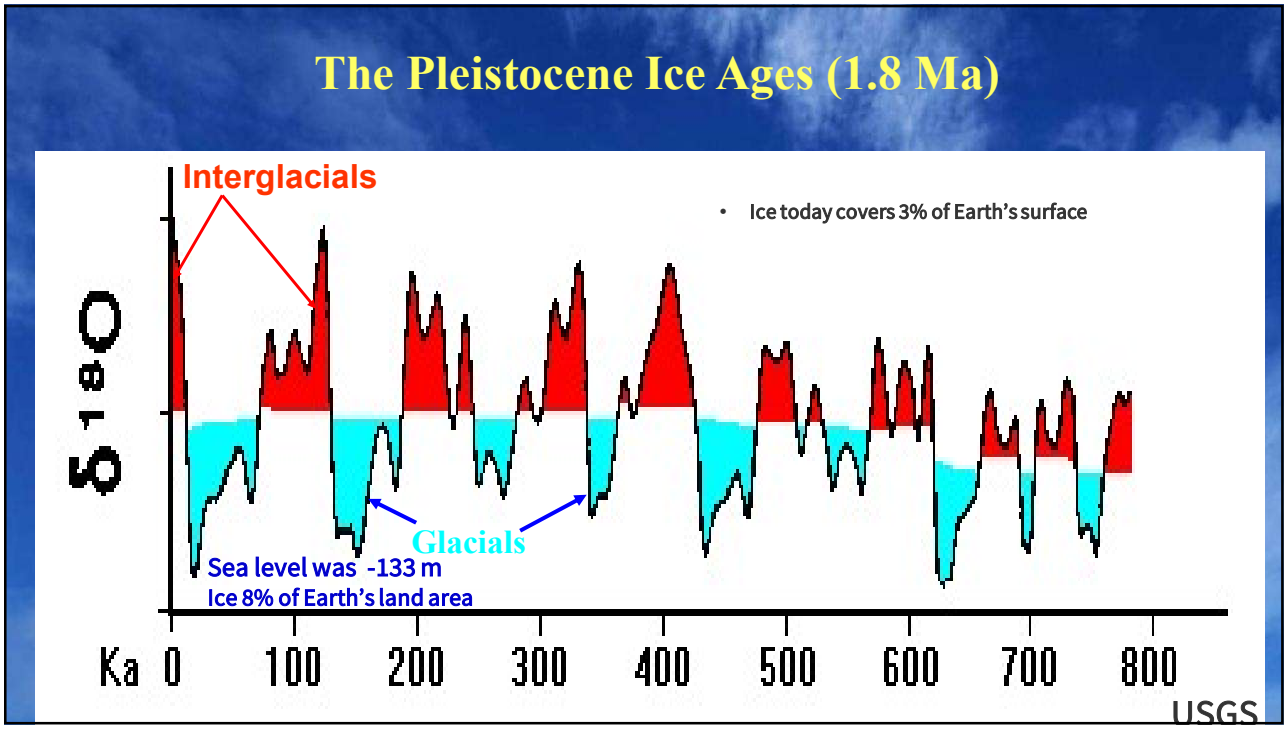
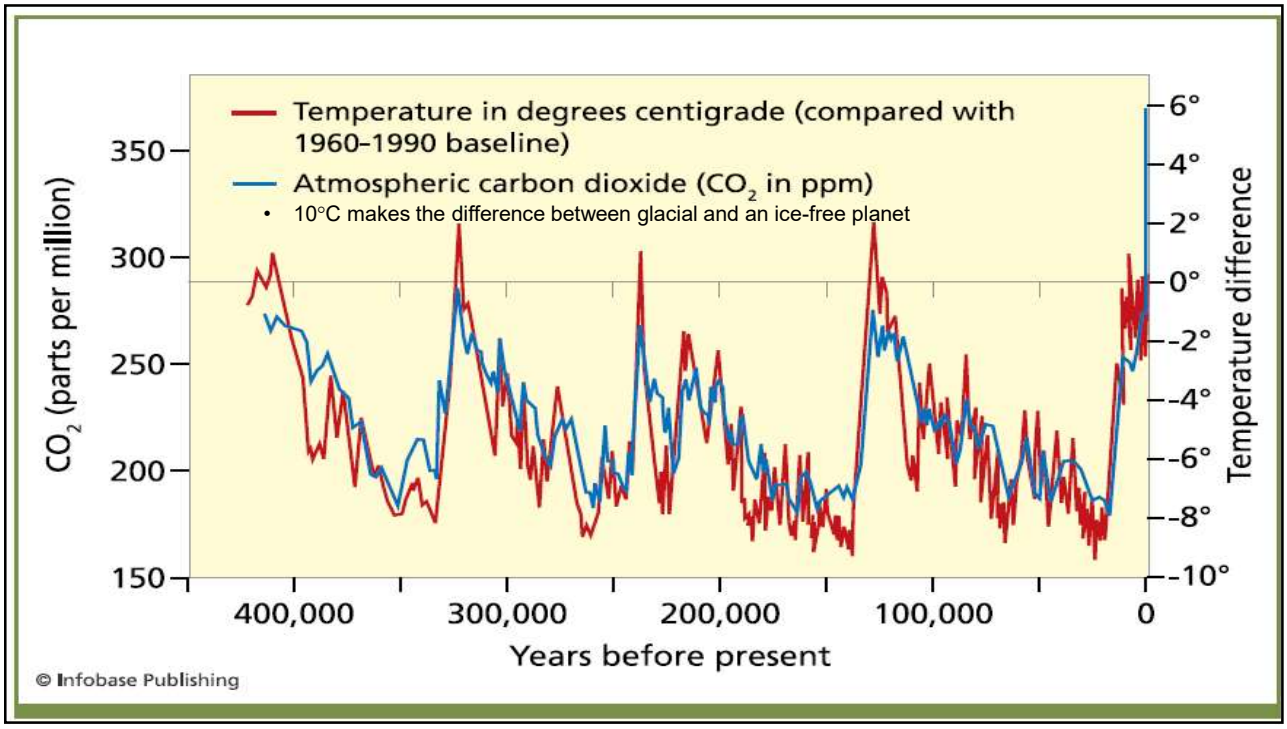


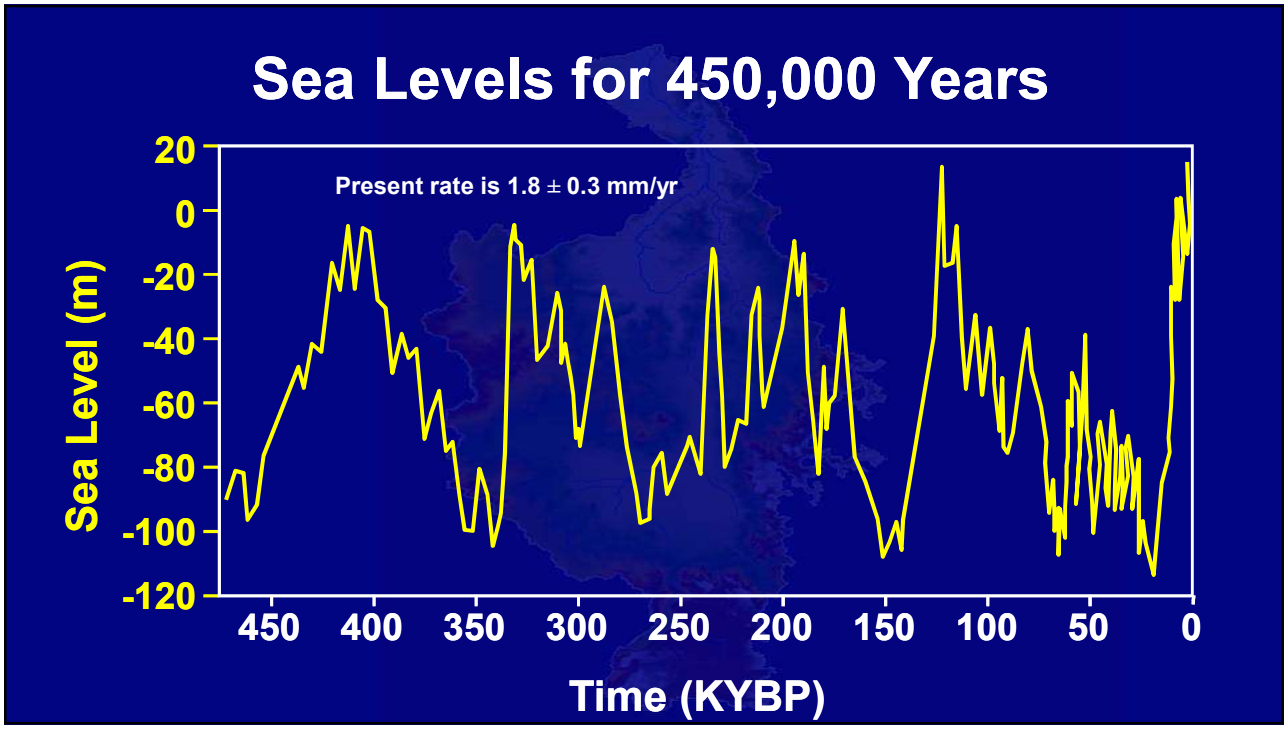
Extinctions through Phanerozoic (600 Ma)

Era	Period	Age(my)
Cenozoic	Quaternary	1.6
	Tertiary	
	Dinasours	65.0
Mesozoic	Cretaceous	144
	Jurassic	208
	Triassiac	245
Paleozoic	Permian	286
	Pennsylvanian	320
	Mississippian	360
	Devonian	408
	Silurian	438
	Ordovician	505
	Cambrian	570
Precambrian		

Extinctions


The Pleistocene Ice Ages (1.8 Ma)
Interglacials
• Ice today covers 3% of Earth's surface
δ18O
Glacials
Sea level was -133 m
Ice 8% of Earth's land area
Ka 0 100 200 300 400 500 600 700 800
USGS


Temperature in degrees centigrade (compared with 1960–1990 baseline)
Atmospheric carbon dioxide (CO2 in ppm)
• 10°C makes the difference between glacial and an ice-free planet
CO2 (parts per million)
350
300
250
200
150
6°
4°
2°
0°
-2°
-4°
-6°
-8°
-10°
Temperature difference
400,000
300,000
200,000
100,000
0
Years before present
© Infobase Publishing



Why will sea level rise as the climate warms?

- **Melting of sea ice and glaciers:**

  What is the difference between sea ice and glaciers?

  Sea ice forms and melts strictly in the ocean whereas glaciers are formed on land.

- **Thermal expansion of seawater**

  i.e., the fact that seawater expands as it warms.

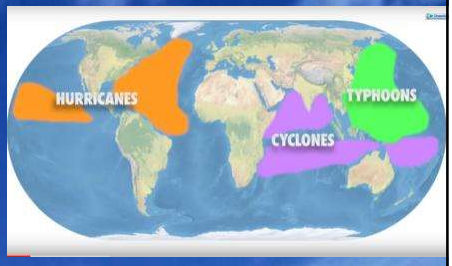
Why are glaciers melting?

- Natural increase in Earth's surface temperature.
- Human activities:

  Since the early 1900s, many glaciers around the world have been rapidly melting. Specifically, since the industrial revolution, carbon dioxide and other greenhouse gas emissions have raised temperatures, even higher in the poles, and as a result, glaciers are rapidly melting, calving off into the sea.

What are the effects of melting glaciers on sea level rise?

- Increasing coastal erosion.
- More frequent and intense coastal storms like hurricanes and typhoons.
- Disrupting weather patterns worldwide.
- Coastal communities face billion-dollar disaster recovery bills.

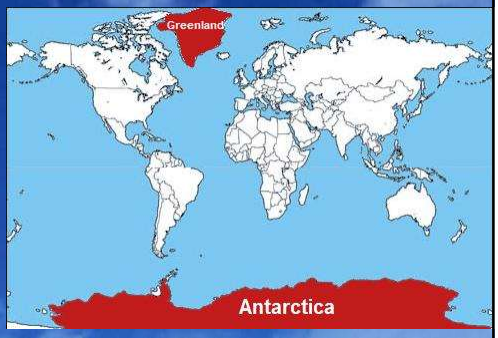


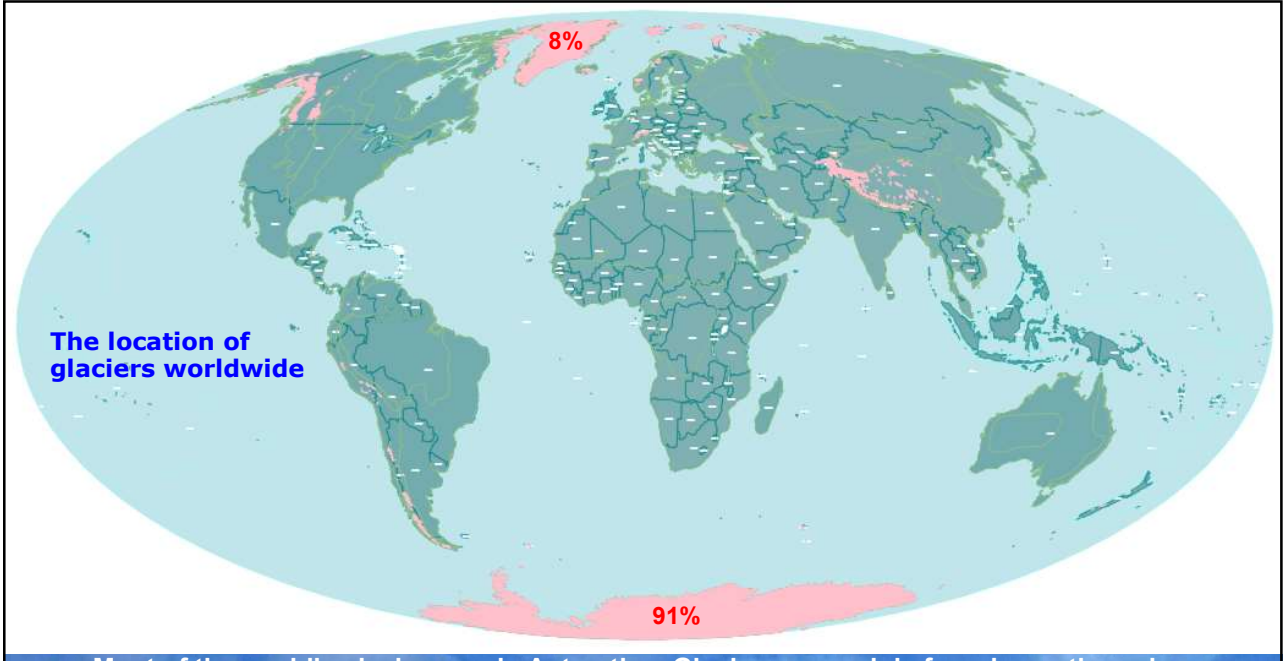
Why are glaciers important?

- Ice acts like a protective cover over the Earth and our oceans. These bright white spots reflect excess heat back into space and keep the planet cooler.

- Today, about 10% of land area on Earth is covered with glacial ice

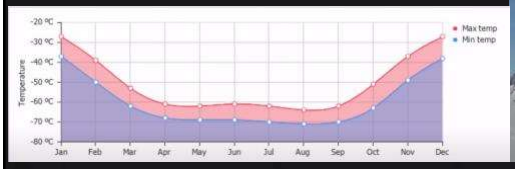
  (91% Antarctica -55°C, 8% Greenland)

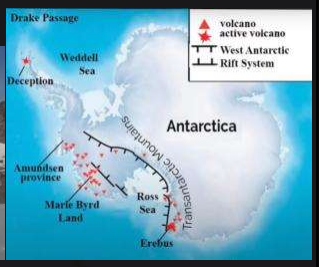


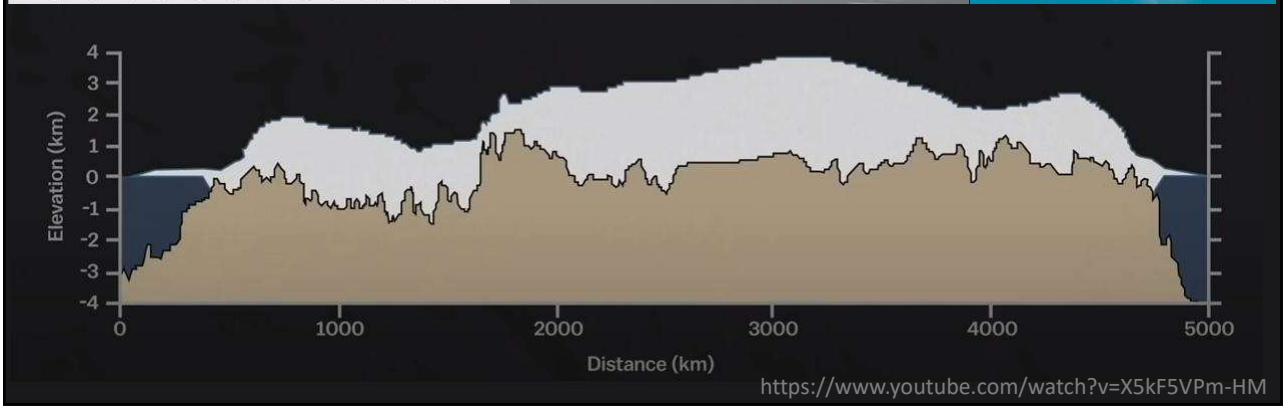


Most of the world's glaciers are in Antarctica. Glaciers are mainly found near the poles, but glaciers exist on all the world's continents except Australia.

ANTARCTIC ICE SHEET





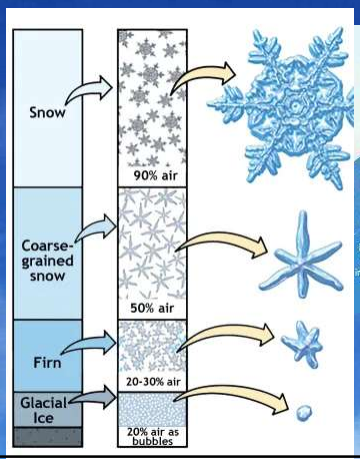


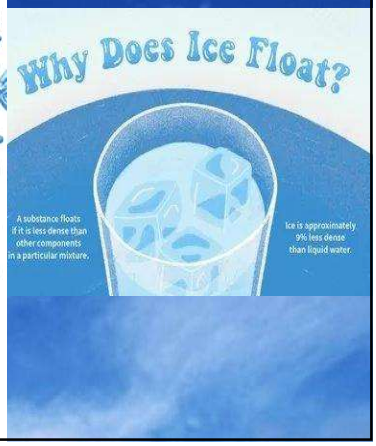
https://www.youtube.com/watch?v=X5kF5VPm-HM

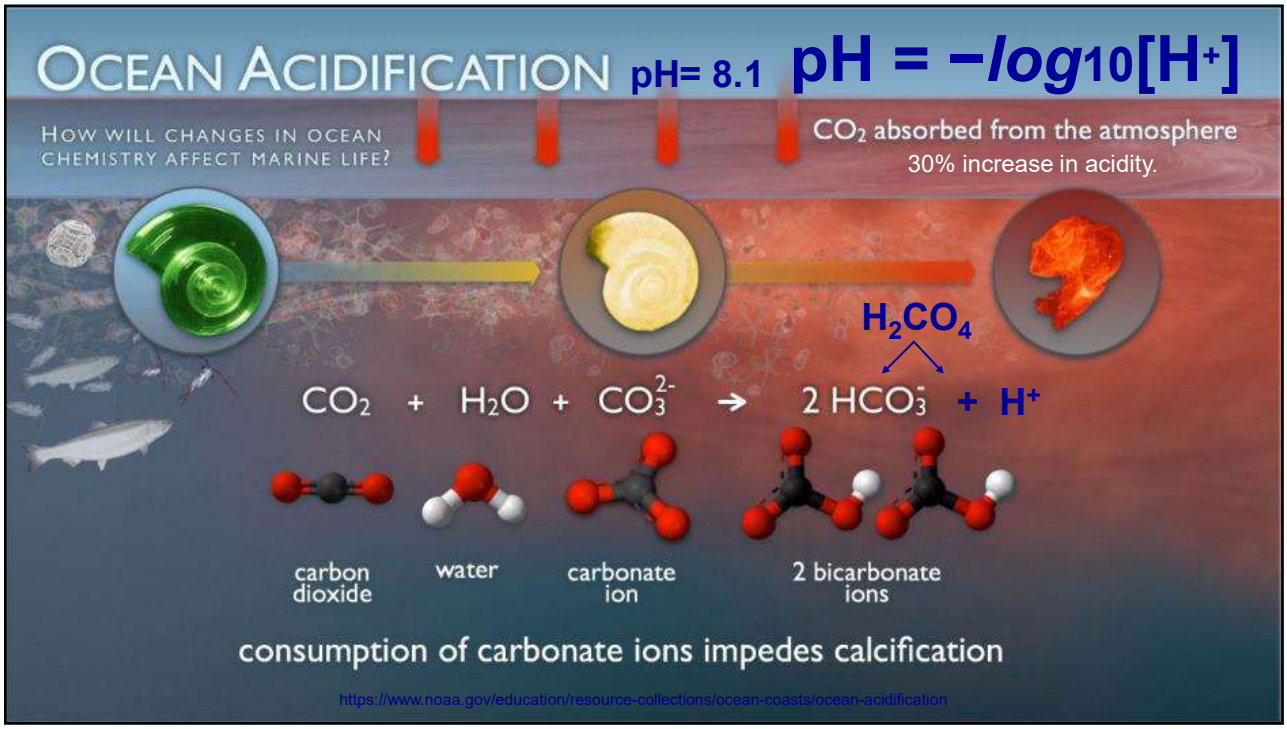
What is the difference between sea ice and glaciers?

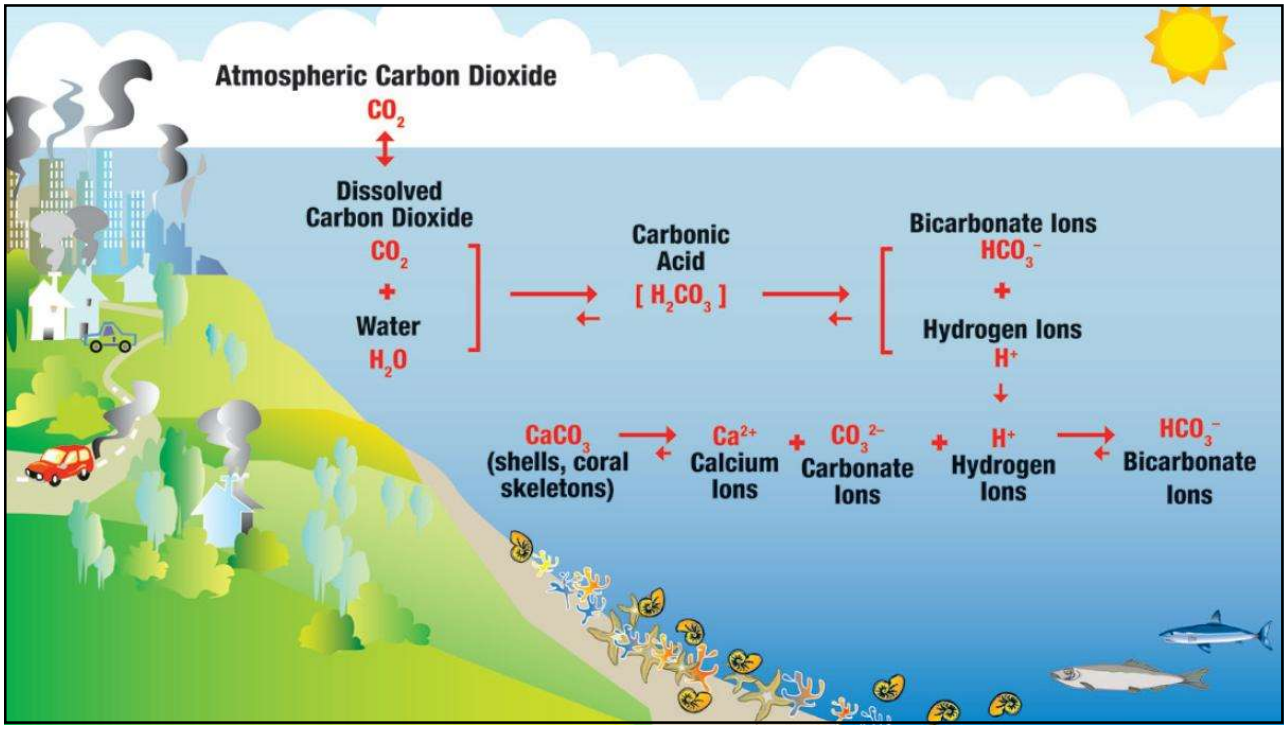
- **Why does ice float on water?**
- **What will happen to the surface of the water when all ice pieces melt?**
  - **Will go up**
  - **Will not change**
  - **Will go down**

When the ice was floating, the volume of water displaced has the mass equal to that of ice. After melting, that mass of ice has been converted into water.






OCEAN ACIDIFICATION
pH= 8.1
pH = −log10[H+]
HOW WILL CHANGES IN OCEAN CHEMISTRY AFFECT MARINE LIFE?
CO2 absorbed from the atmosphere
30% increase in acidity.
H2CO4
CO2 + H2O + CO3 2- → 2 HCO3- + H+
carbon dioxide
water
carbonate ion
2 bicarbonate ions
consumption of carbonate ions impedes calcification
https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-acidification


Atmospheric Carbon Dioxide
CO2
Dissolved Carbon Dioxide
CO2
+
Water
H2O
Carbonic Acid
[H2CO3]
Bicarbonate Ions
HCO3-
+
Hydrogen Ions
H+
CaCO3 (shells, coral skeletons)
Ca2+ Calcium Ions
+ CO3 2- Carbonate Ions
+ H+ Hydrogen Ions
HCO3- Bicarbonate Ions

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- Meteorite impact

Earth Factors

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Human Causes of Climate Change

releasing greenhouse gases

- burning of fossil fuels and biomass
- Deforestation
- Urbanization

Air Pollution
- SO_2, NO_x, Hg
  Particulates, Radiation

CO_2 Emissions
- Most carbon intensive fuel
- 43% of global CO_2

Earth's Atmospheric Gases

Nitrogen (N_2) 78.08%

Oxygen (O_2) 20.95%

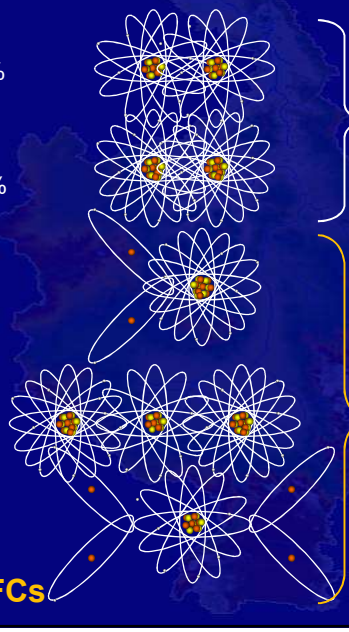
Water (H_2O)

Carbon Dioxide (CO_2)

Methane (CH_4)

Nitrous Oxides NO_x

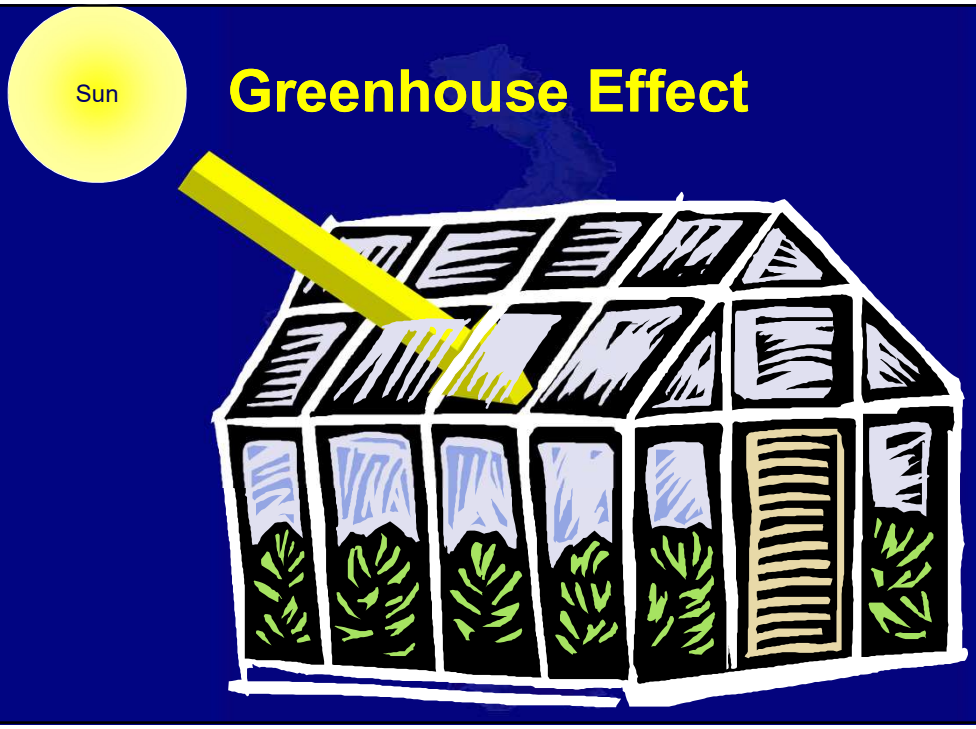
Hydrofluorocarbons: HFCs



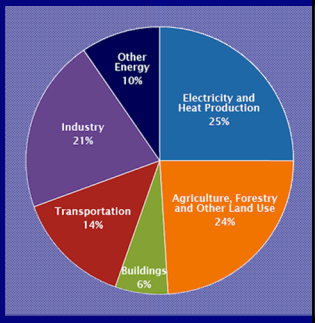
99% Non-Greenhouse Gases

1% Greenhouse Gases

Greenhouse Effect



What are the most important sources of GHGs and black carbon?



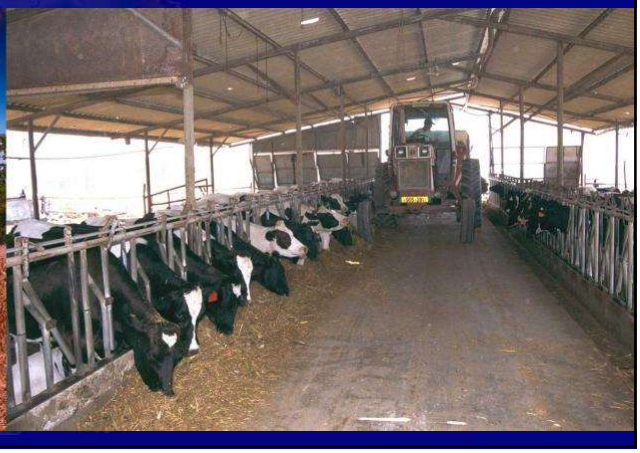
- **Fossil fuel**
  Oil, Natural gas, Coal
  (power generation, industry, transportation, buildings)

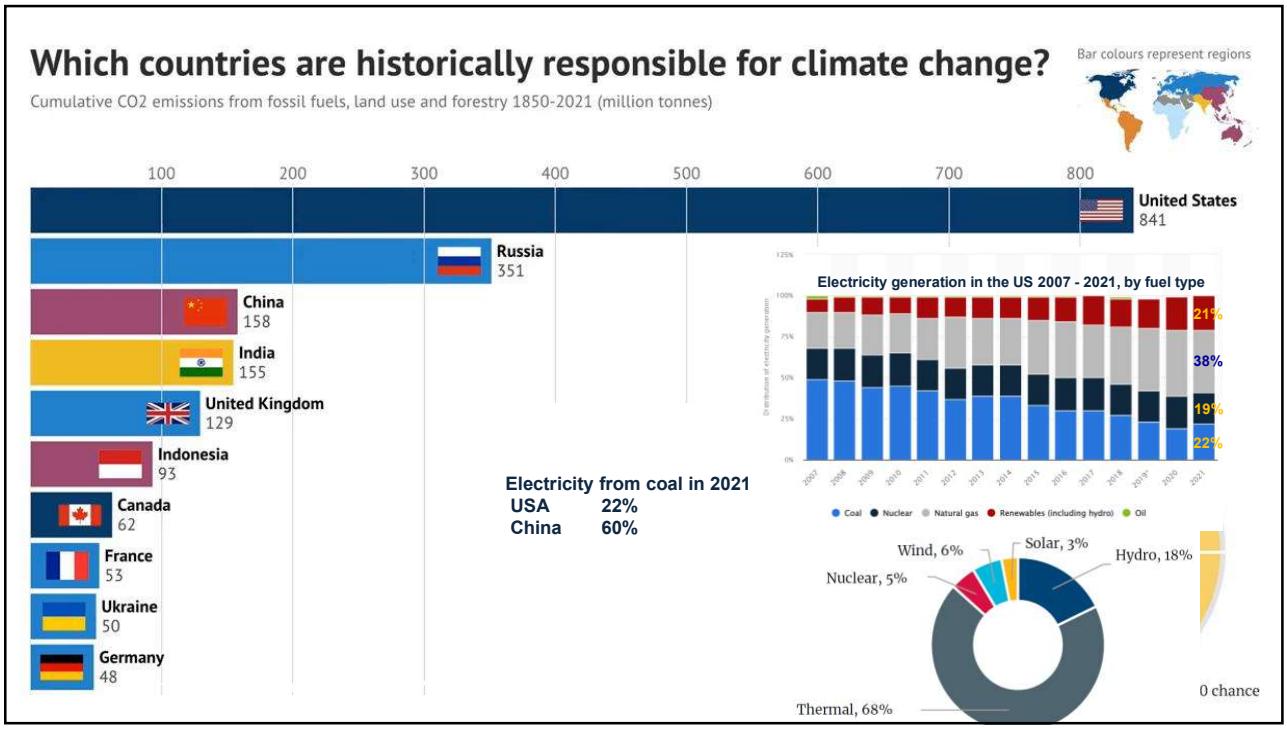
- **Agriculture**
  (animals – cows and pigs), feed production, chemical intensive food production, and flooded paddy rice production, as well as deforestation driven by the desire to expand cultivated areas

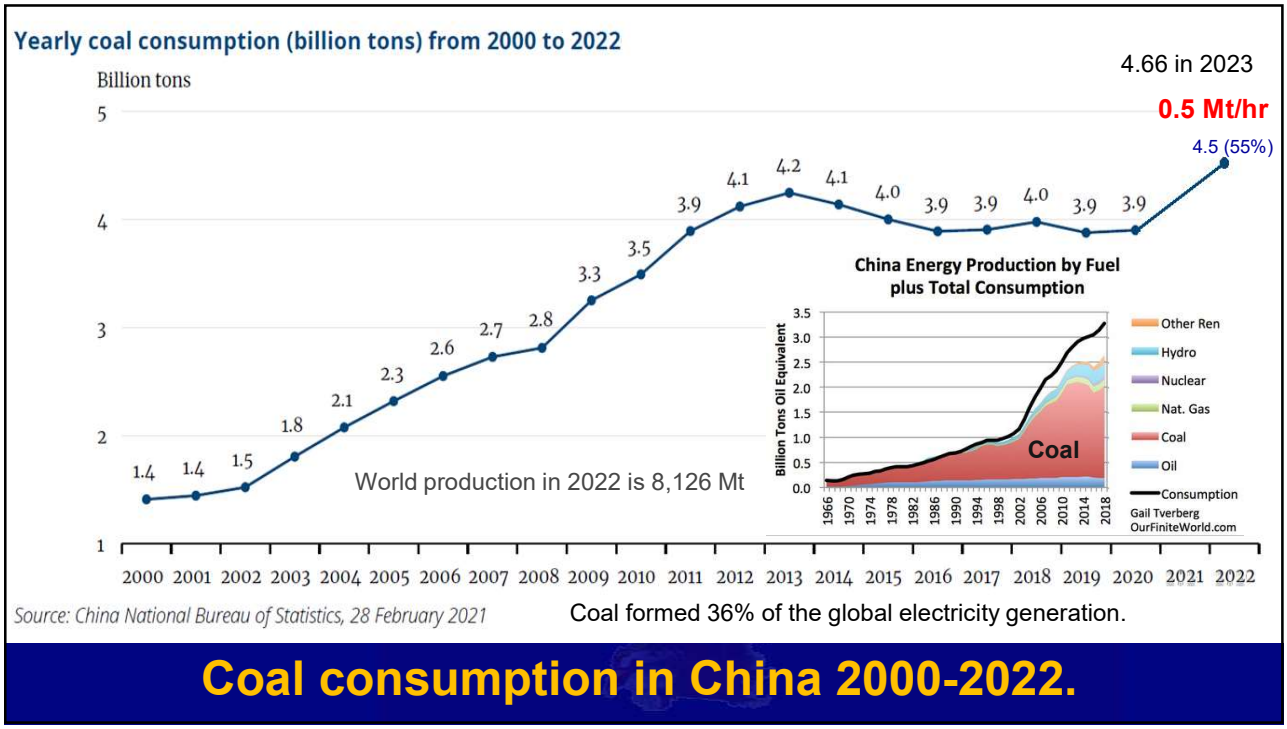
Agricultural activities

Increasing Greenhouse Gases:

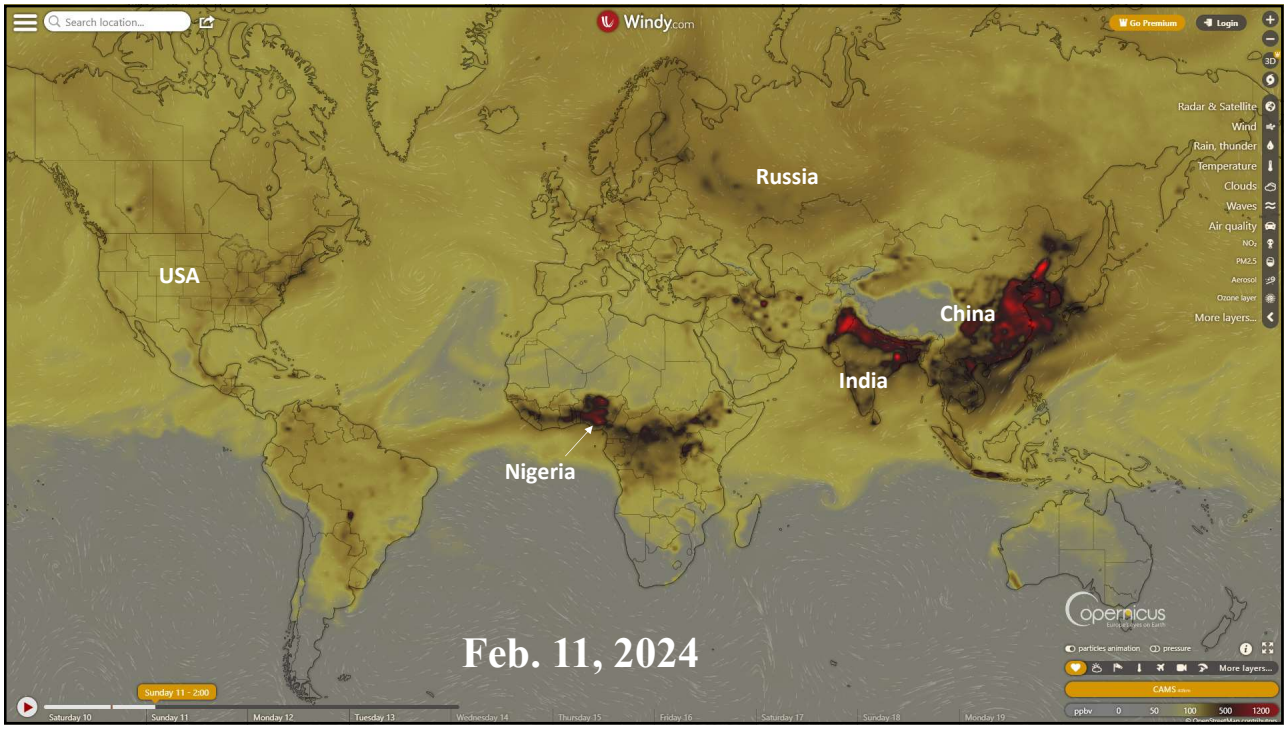
Burning of fossil fuels – Deforestation - pollutants and waste - Industry

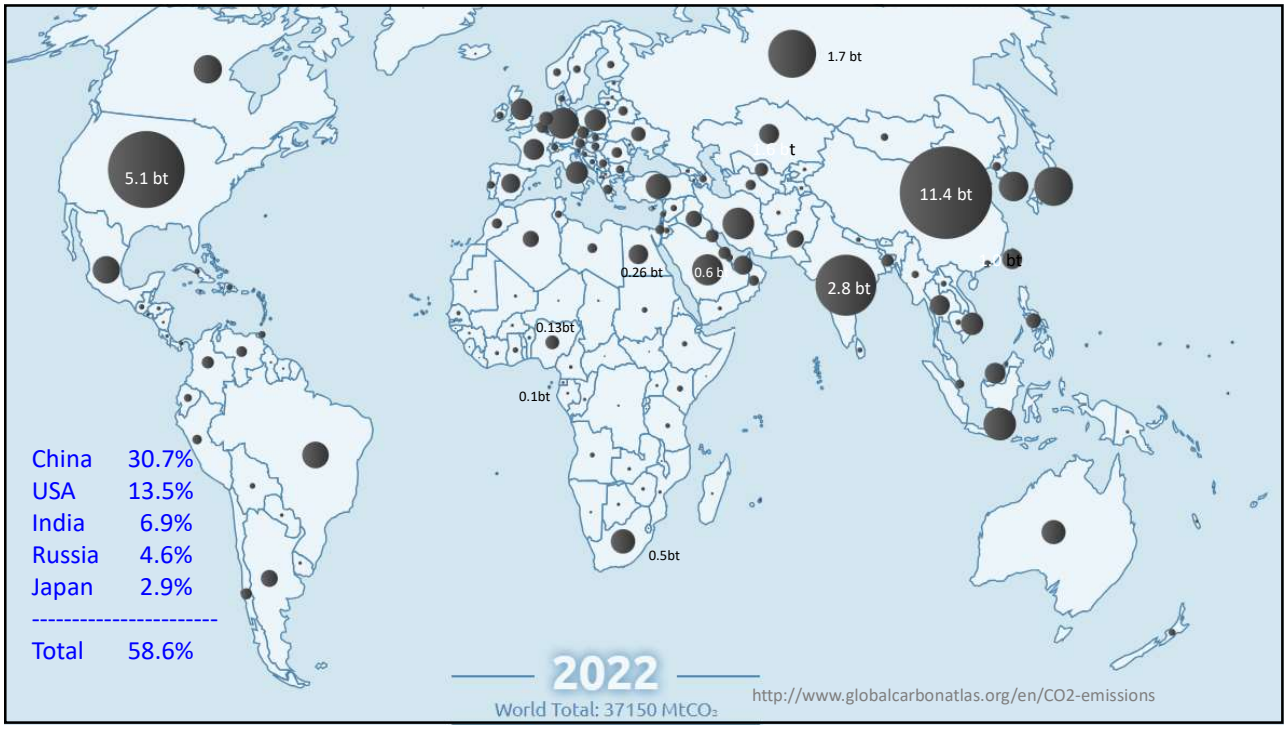


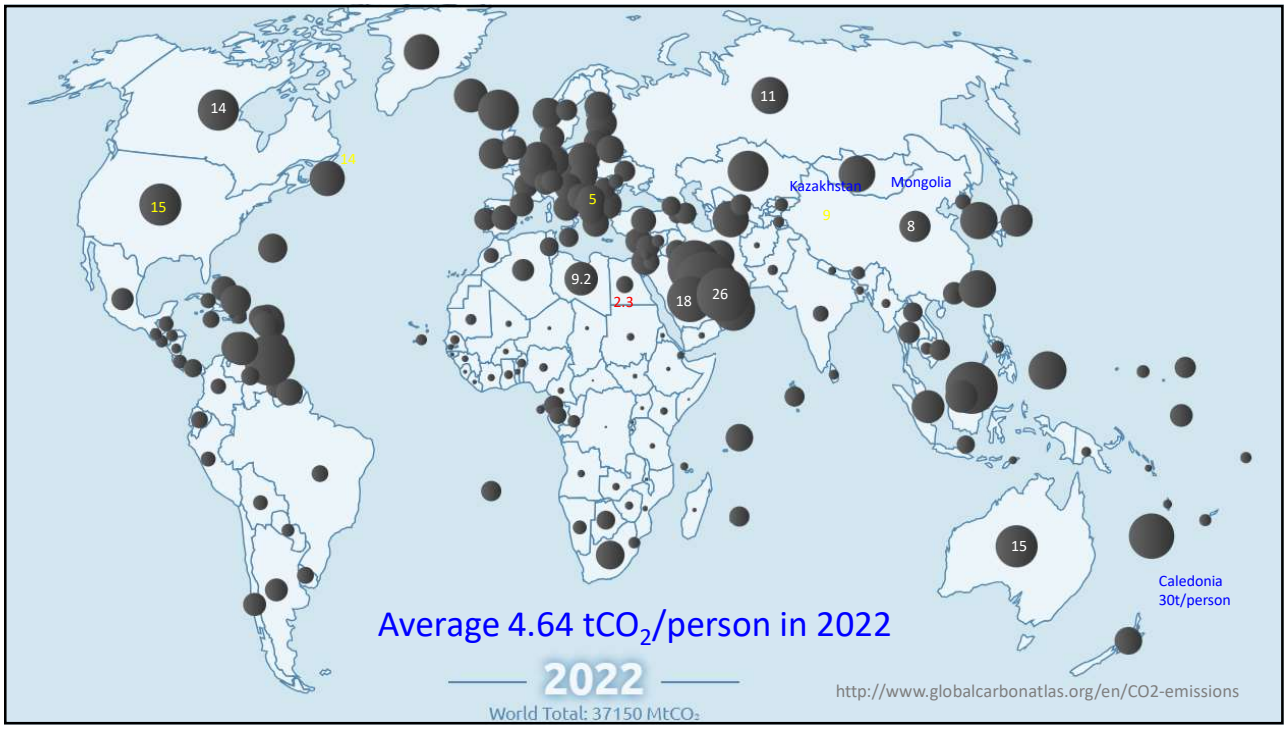




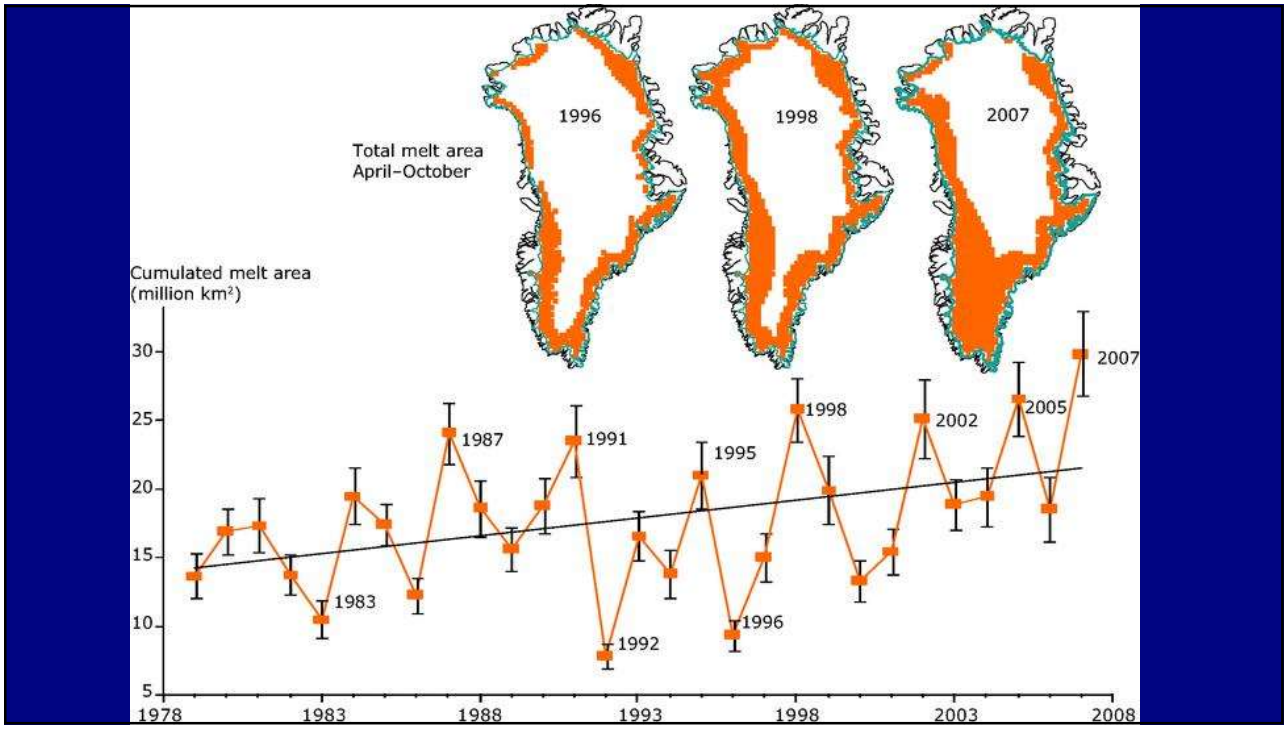
Coal consumption in China 2000-2022.

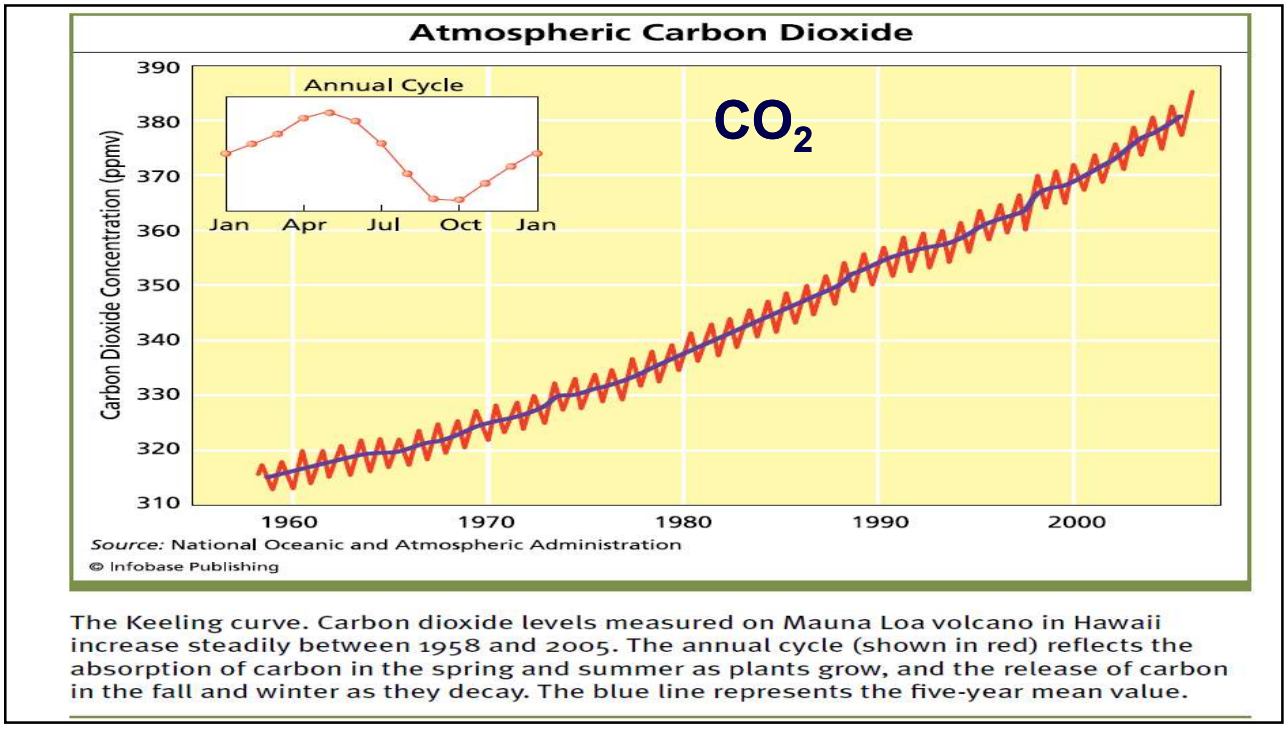

Windy.com
Russia
USA
China
India
Nigeria
Feb. 11, 2024


1.7 bt
5.1 bt
11.4 bt
2.8 bt
0.26 bt
0.13bt
0.1bt
0.5bt
China 30.7%
USA 13.5%
India 6.9%
Russia 4.6%
Japan 2.9%
Total 58.6%
2022
World Total: 37150 MtCO₂
http://www.globalcarbonatlas.org/en/CO2-emissions

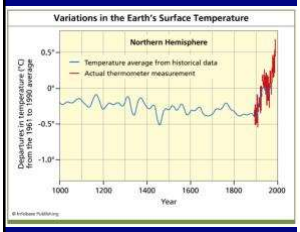

14
11
15
5
9.2
2.3
18
26
Kazakhstan
9
Mongolia
8
15
Caledonia
30t/person
Average 4.64 tCO2/person in 2022
2022
World Total: 37150 MtCO2
http://www.globalcarbonatlas.org/en/CO2-emissions

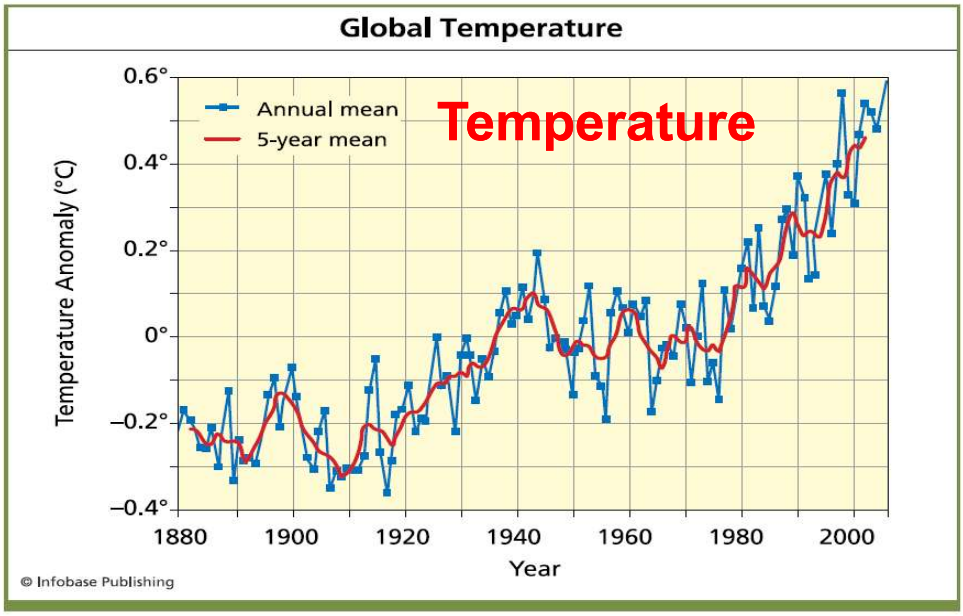

Is the Climate Changing?





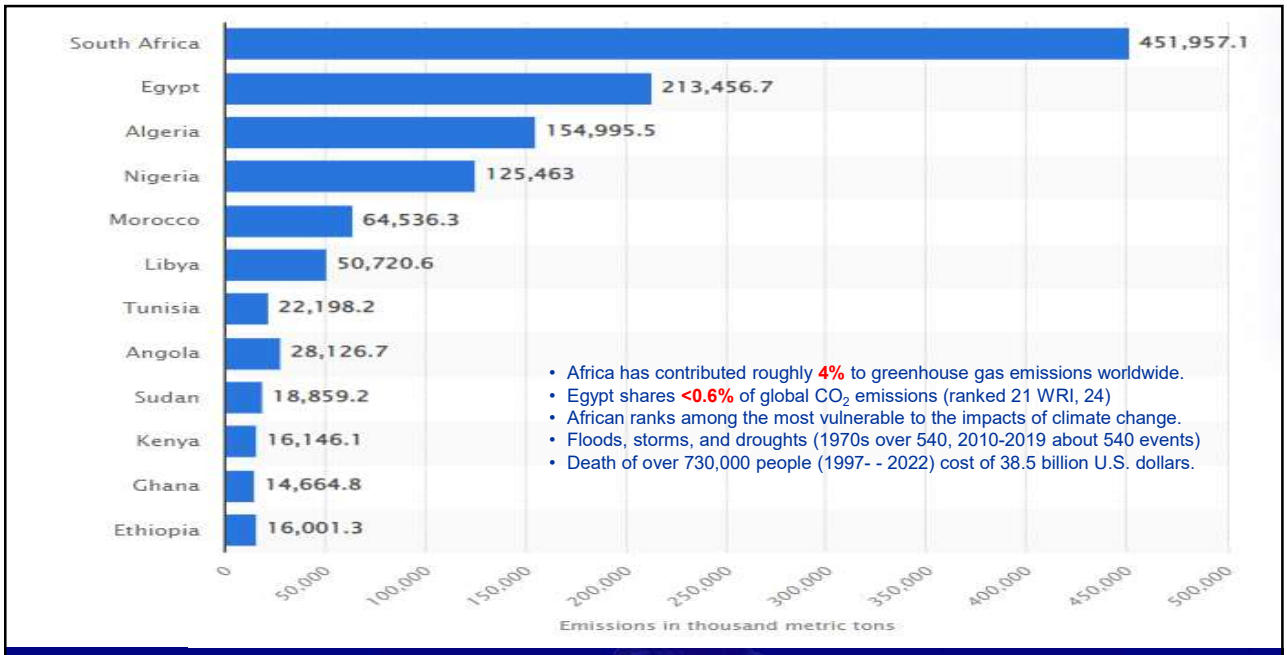
The Keeling curve. Carbon dioxide levels measured on Mauna Loa volcano in Hawaii increase steadily between 1958 and 2005. The annual cycle (shown in red) reflects the absorption of carbon in the spring and summer as plants grow, and the release of carbon in the fall and winter as they decay. The blue line represents the five-year mean value.

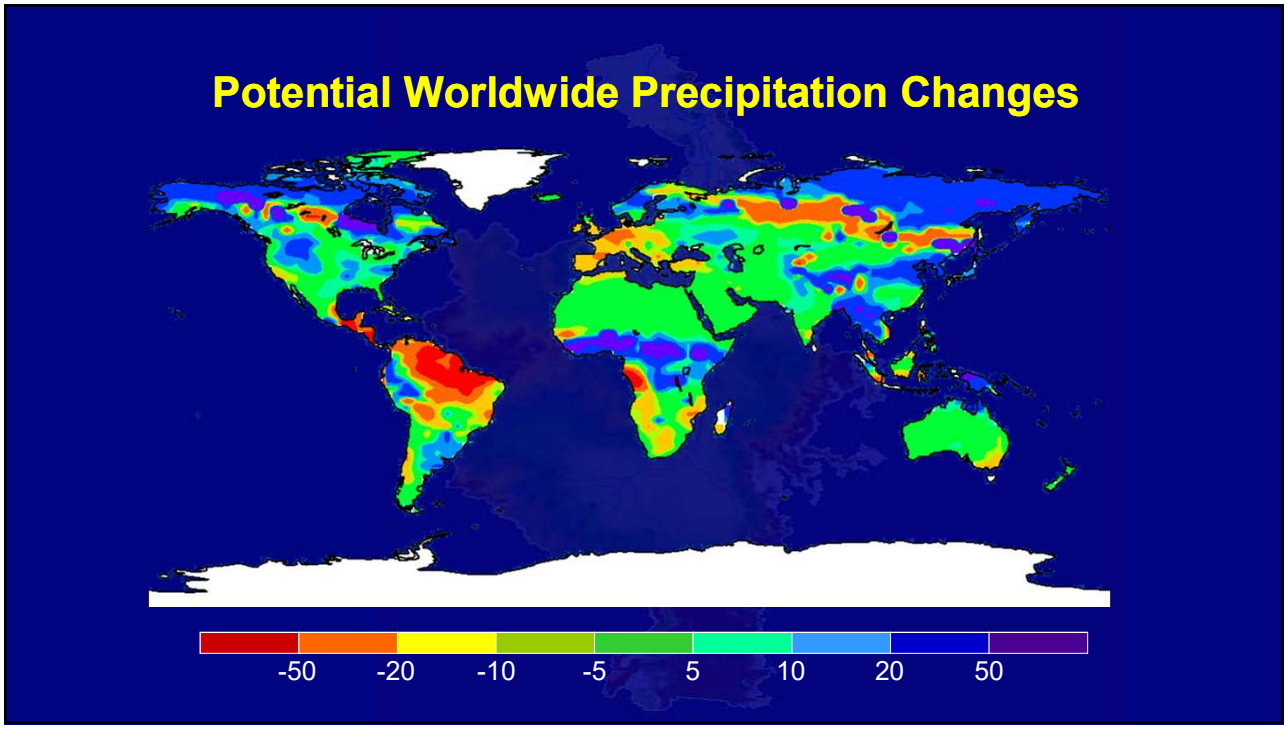


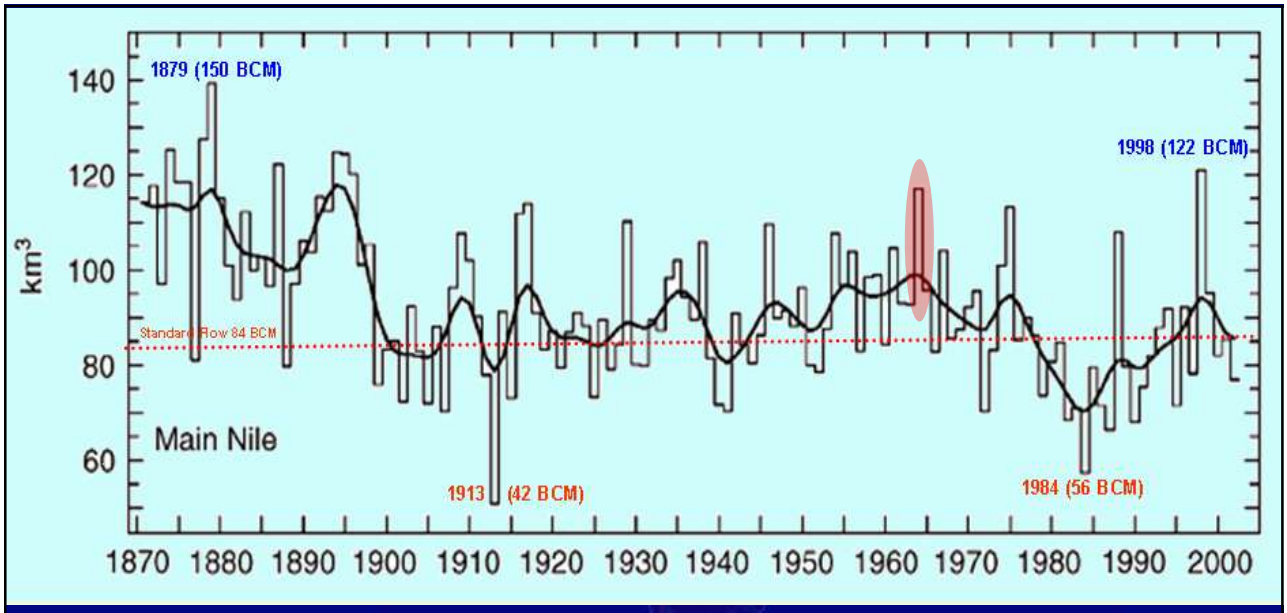


Average measured temperatures from 1880 to 2005. The boxes connected by the blue line show the annual mean measured temperature. The red line is the 5-year mean. The zero line is the 1961 to 1990 average temperature.

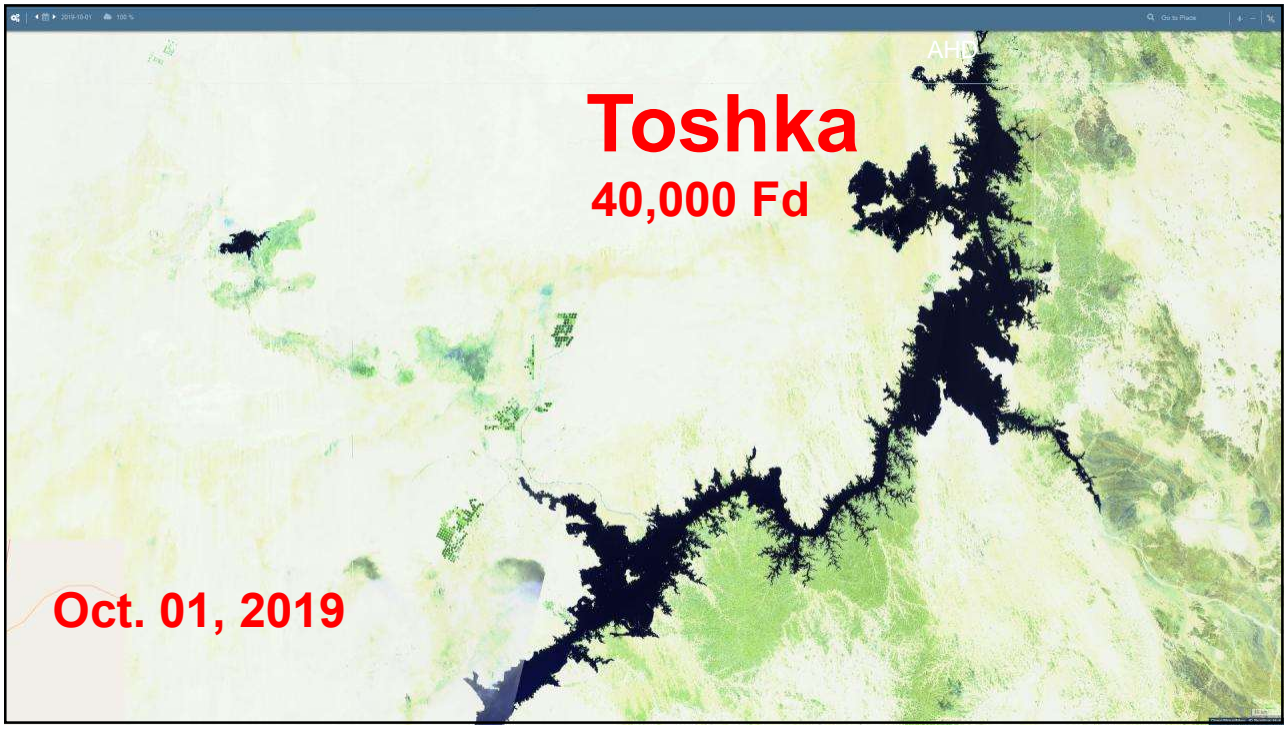
Recent sea level rise. The rise in sea level in centimeters from 1880 to 2005. The red line represents the three-year average.

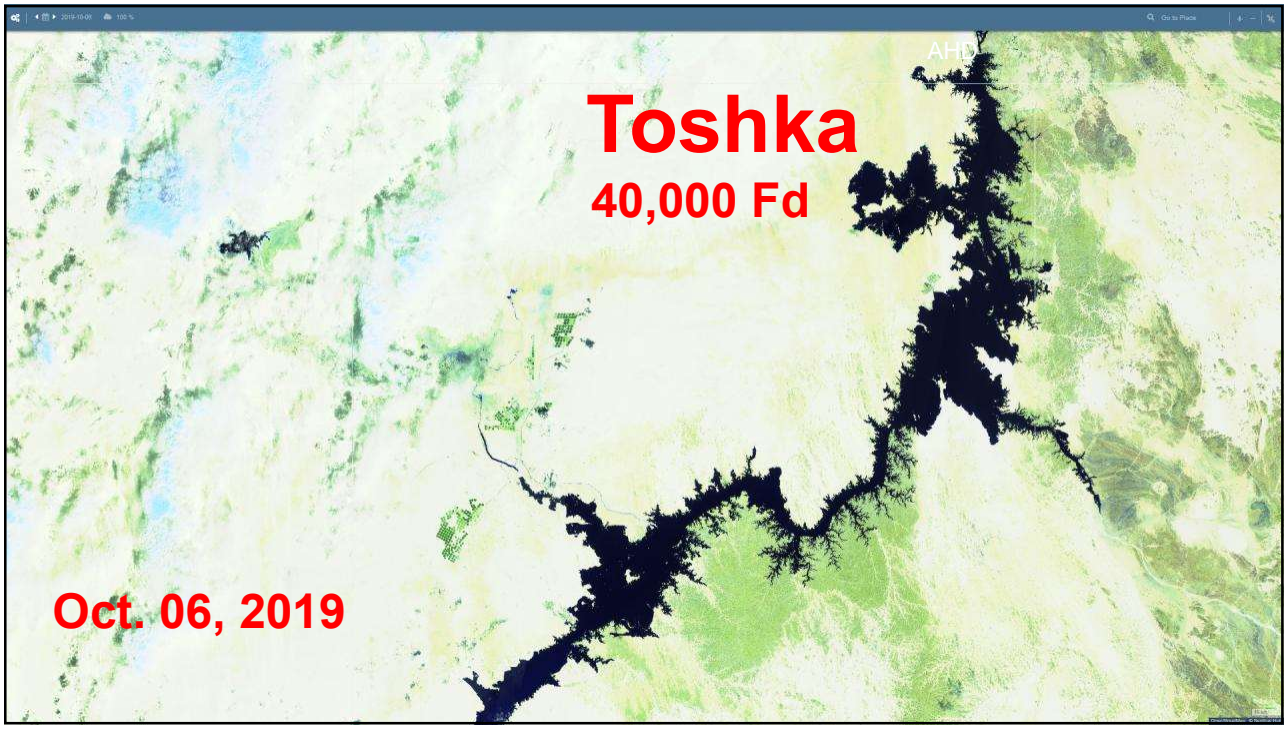

South Africa
451,957.1
Egypt
213,456.7
Algeria
154,995.5
Nigeria
125,463
Morocco
64,536.3
Libya
50,720.6
Tunisia
22,198.2
Angola
28,126.7
Sudan
18,859.2
Kenya
16,146.1
Ghana
14,664.8
Ethiopia
16,001.3
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000
450,000
500,000
Emissions in thousand metric tons
• Africa has contributed roughly 4% to greenhouse gas emissions worldwide.
• Egypt shares <0.6% of global CO_2 emissions (ranked 21 WRI, 24)
• African ranks among the most vulnerable to the impacts of climate change.
• Floods, storms, and droughts (1970s over 540, 2010-2019 about 540 events)
• Death of over 730,000 people (1997- - 2022) cost of 38.5 billion U.S. dollars.

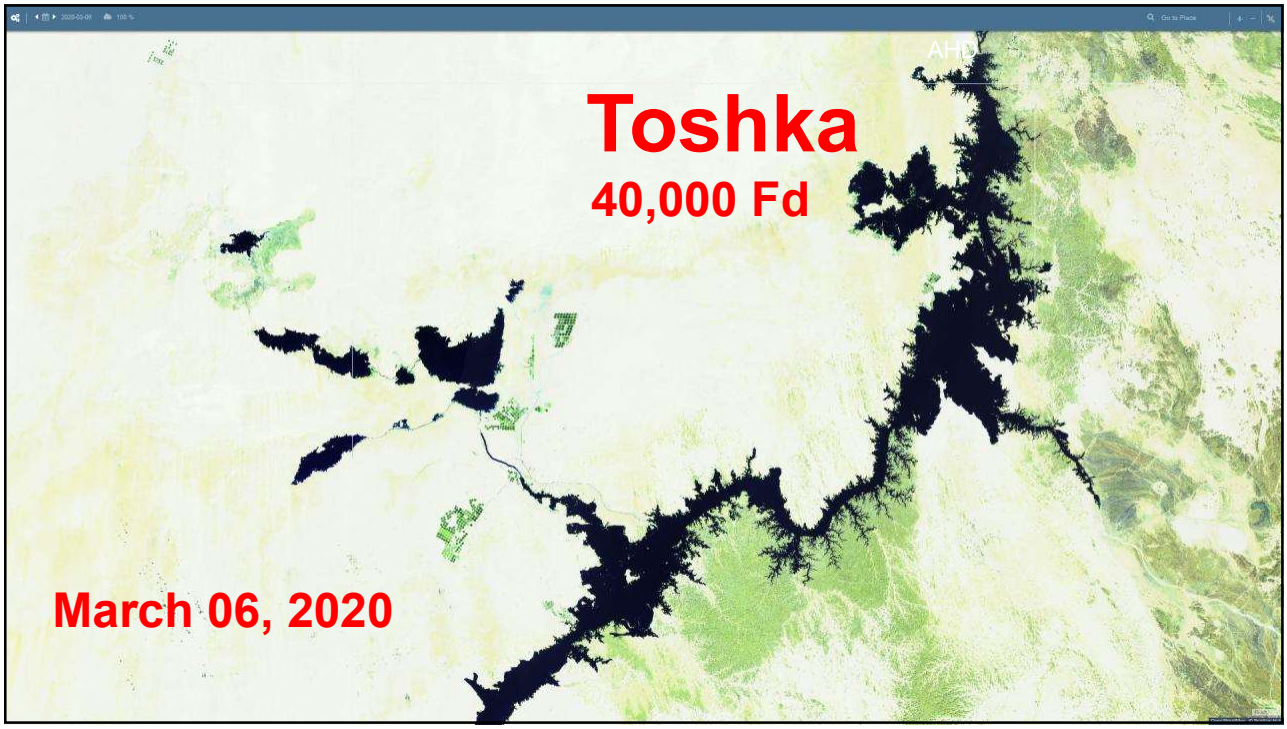

Potential Worldwide Precipitation Changes
-50
-20
-10
-5
5
10
20
50

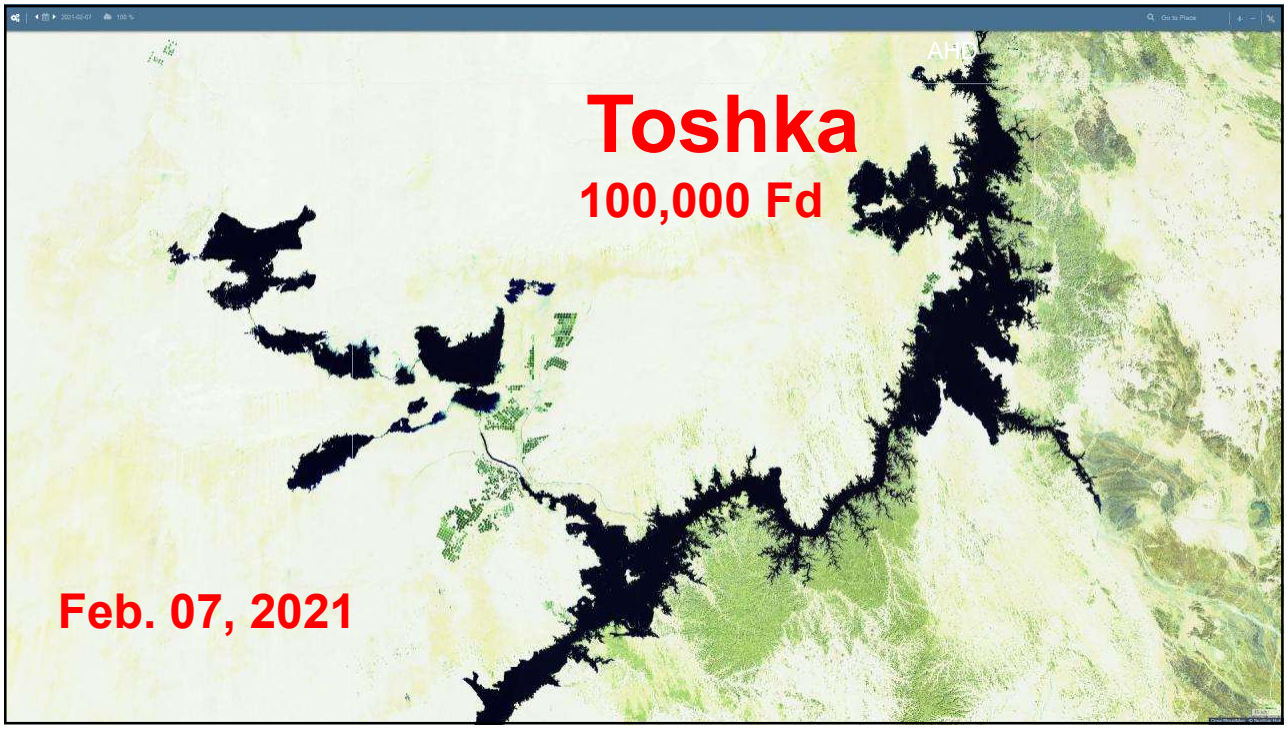


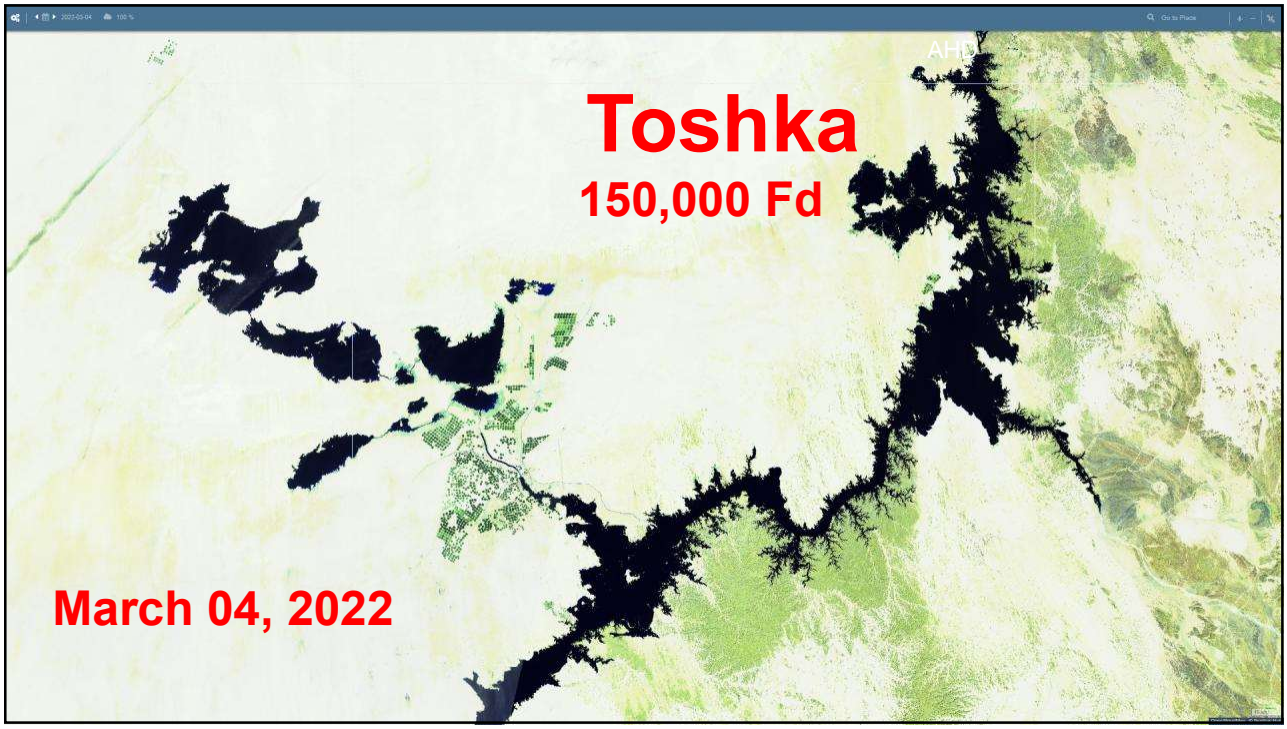
Annual river flows and lake levels for (1870-2000).

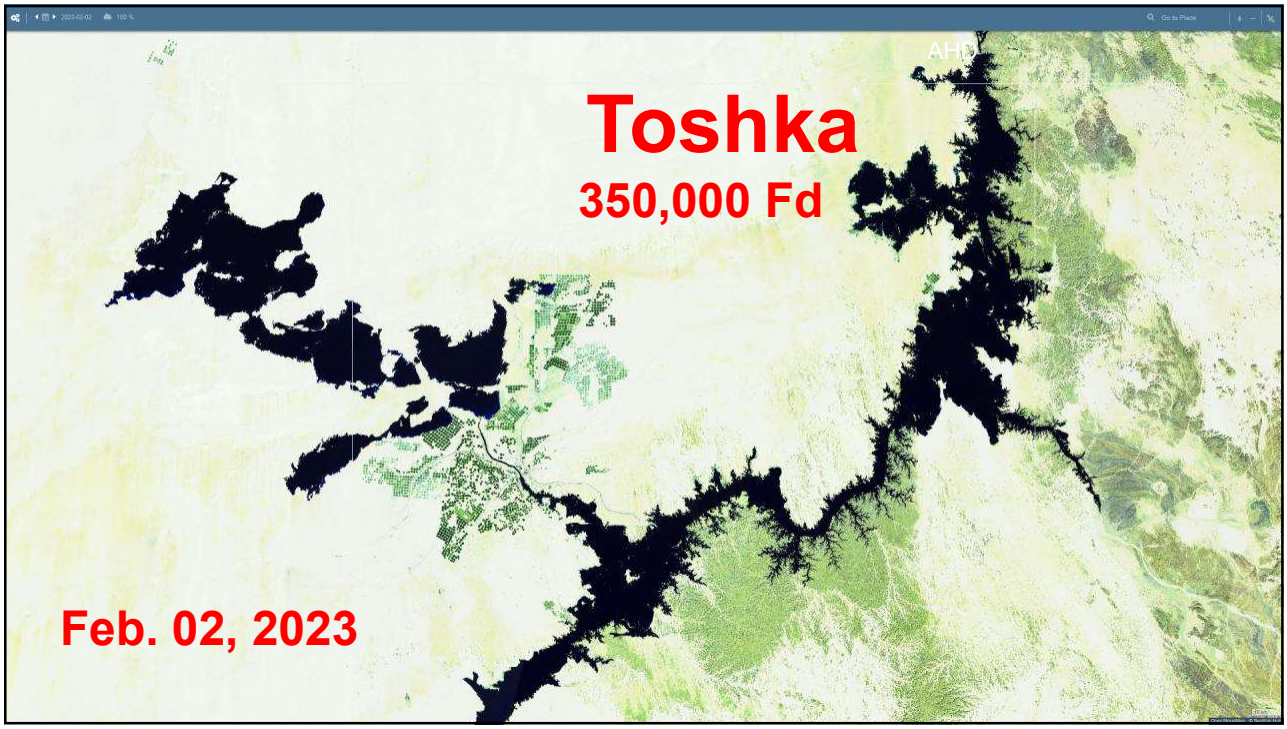


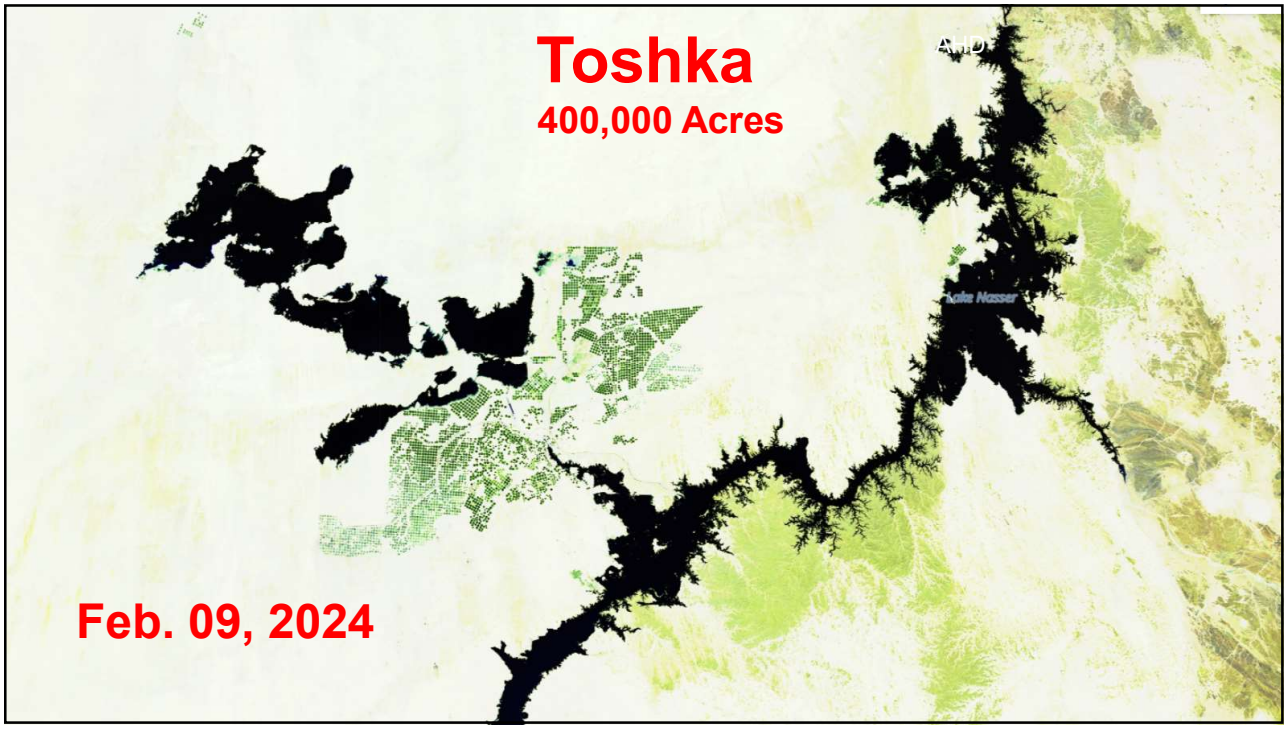

Toshka
40,000 Fd
Oct. 06, 2019

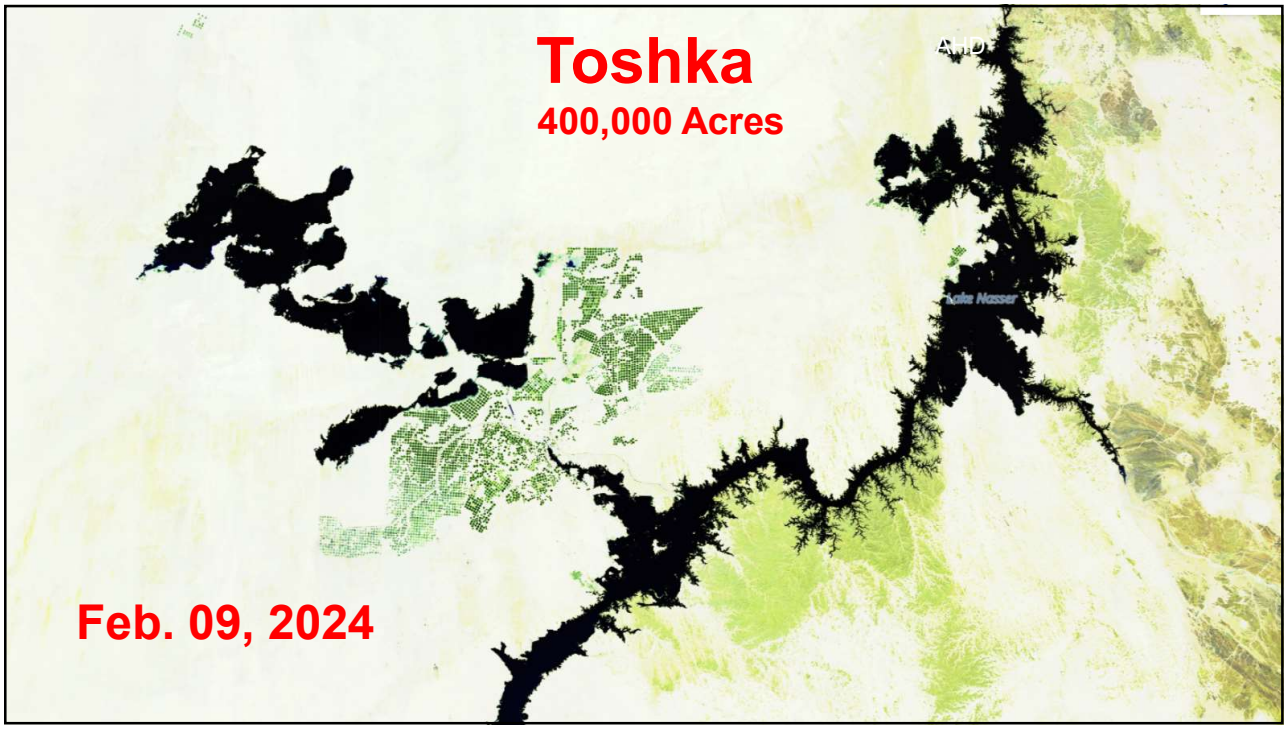

Toshka
40,000 Fd
March 06, 2020

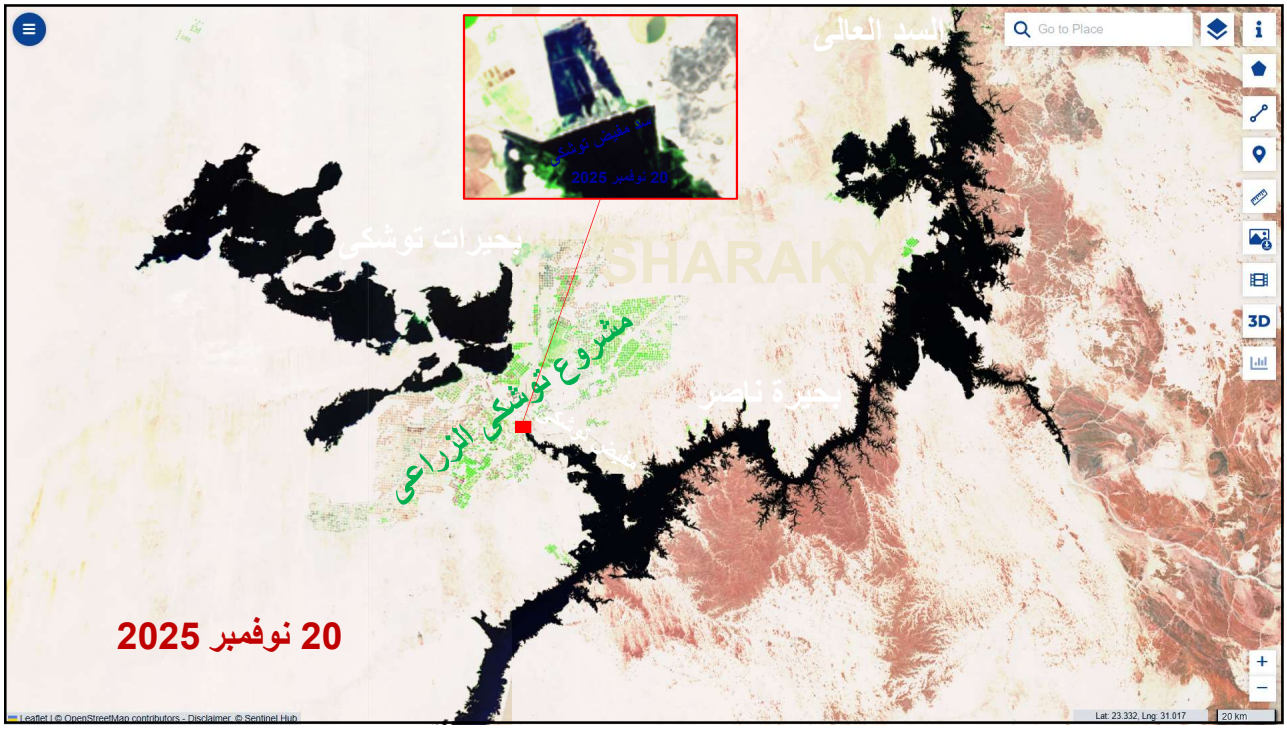

Toshka
100,000 Fd
Feb. 07, 2021

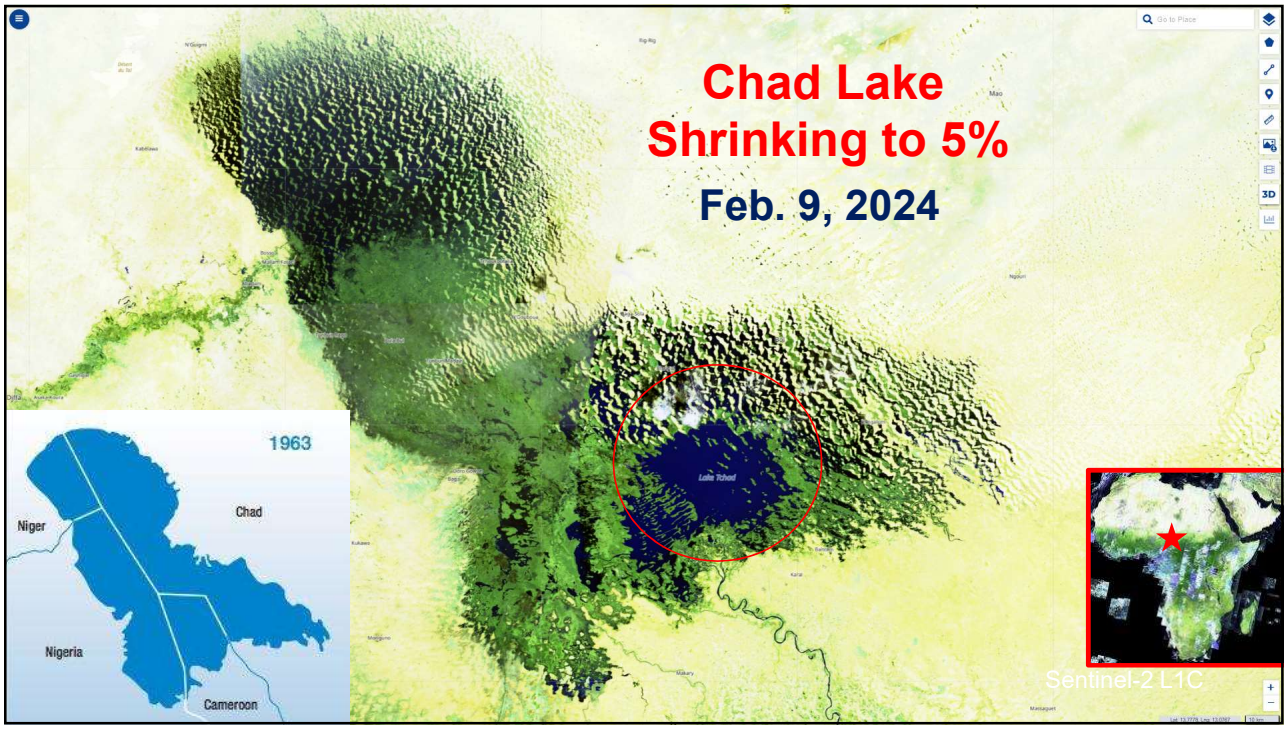

Toshka
150,000 Fd
March 04, 2022

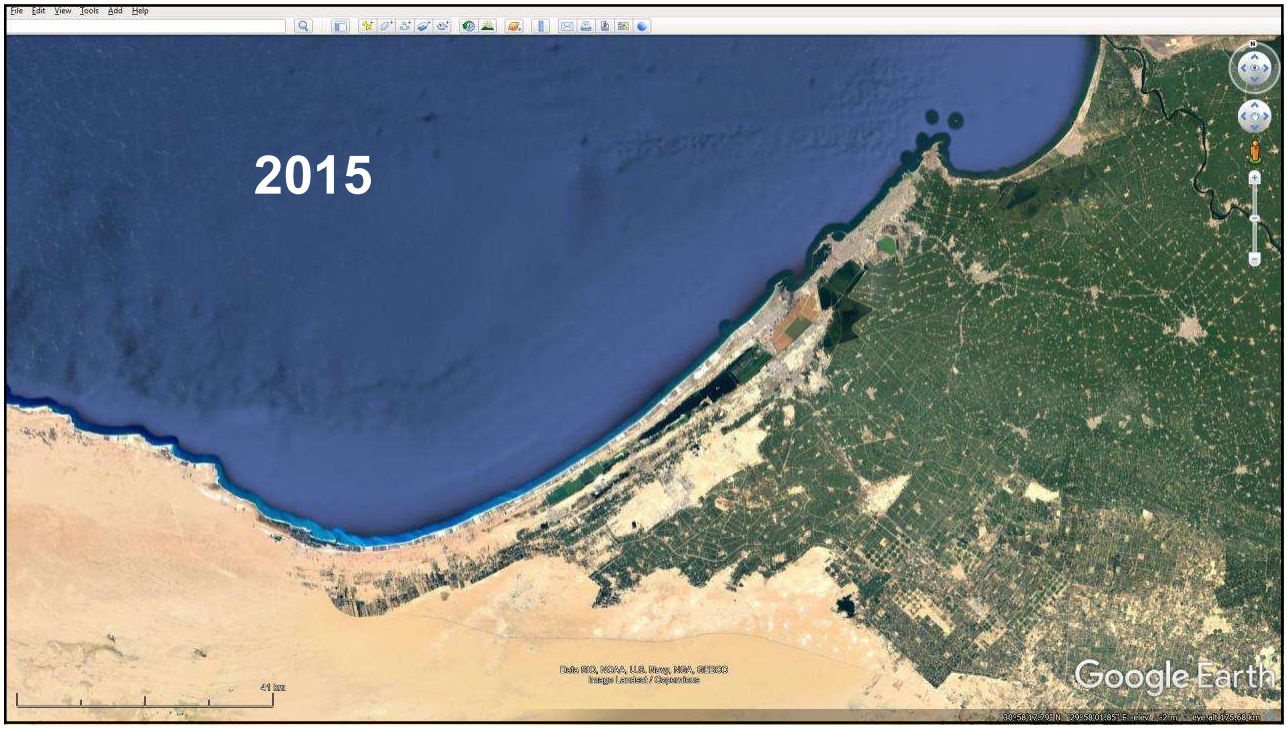

Toshka
350,000 Fd
Feb. 02, 2023

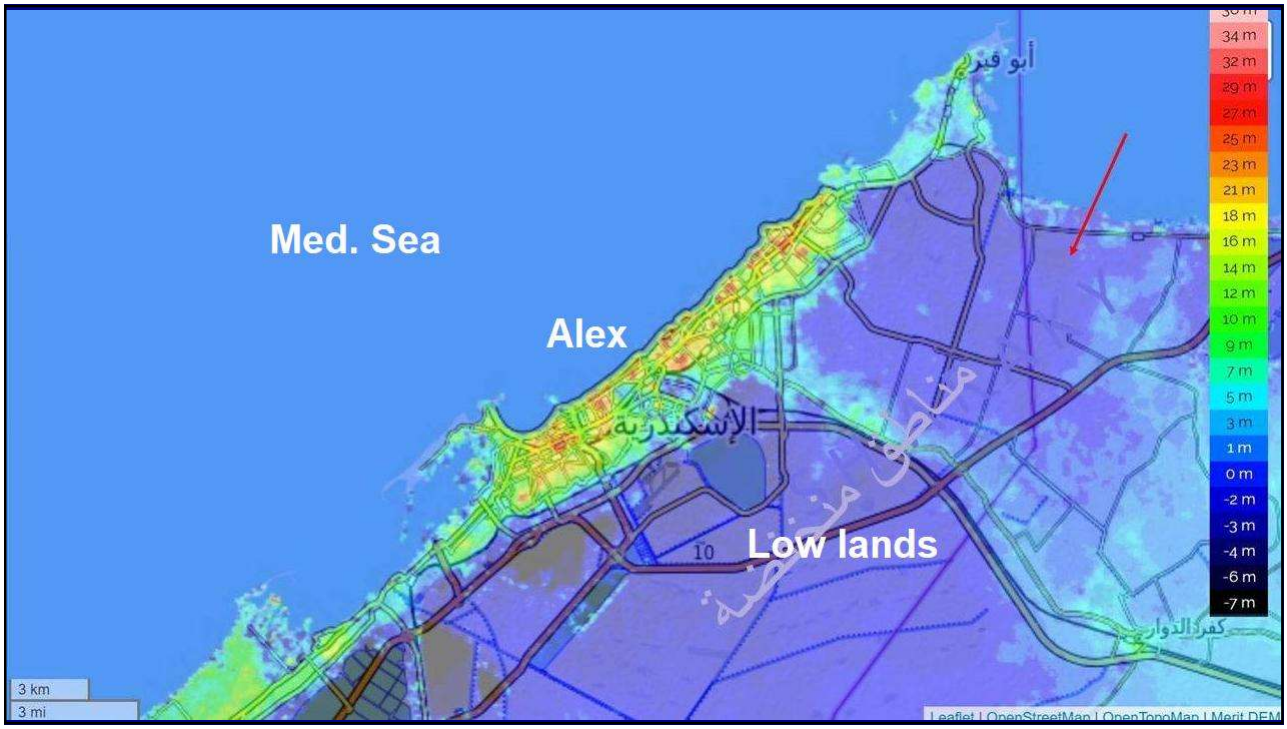

Toshka
400,000 Acres
Feb. 09, 2024


Toshka
400,000 Acres
Feb. 09, 2024


السد العالى
بحيرات توشكى
SHARAKY
مشروع توشكى الزراعى
بحيرة ناصر
20 نوفمبر 2025
Go to Place
3D


Chad Lake
Shrinking to 5%
Feb. 9, 2024
1963
Niger
Chad
Nigeria
Cameroon
Lake Tchad
Sentinel-2 L1C

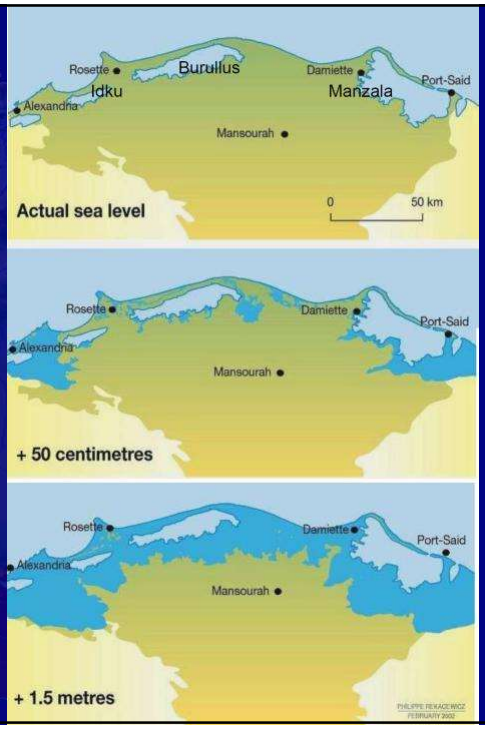

2015
Google Earth

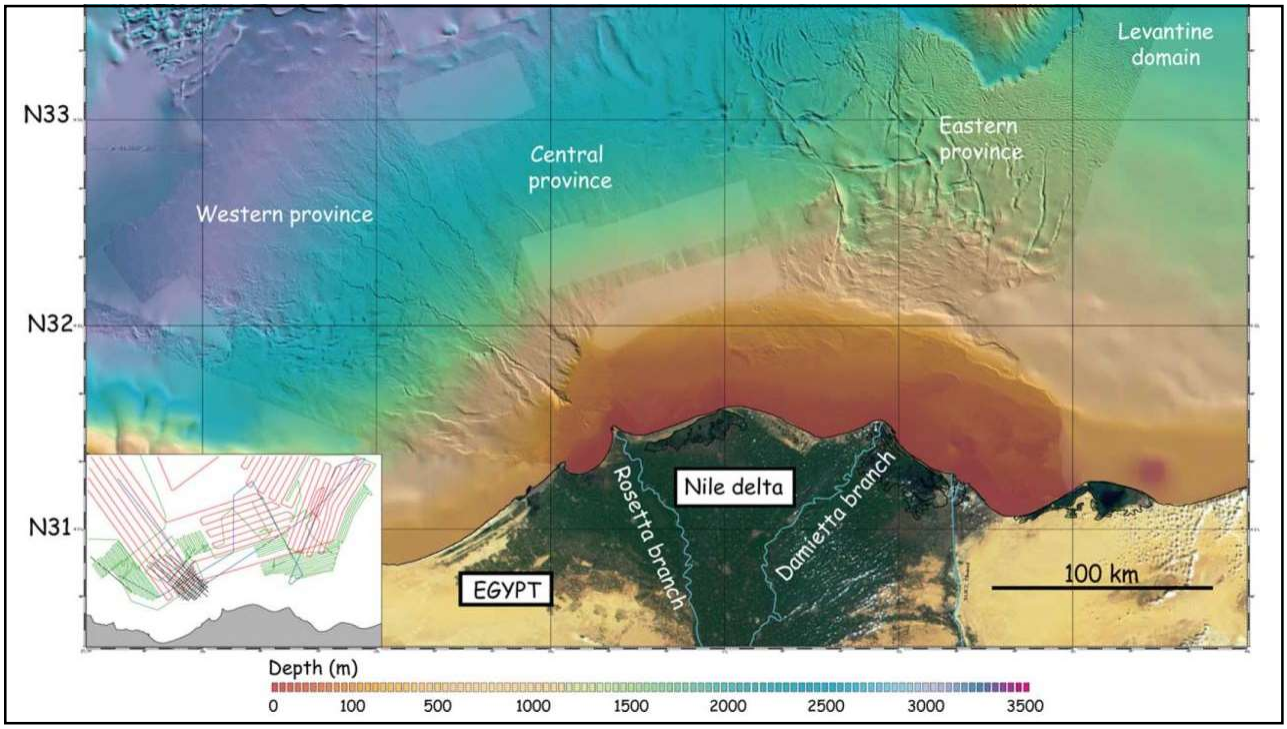


Sea level rise

Sea level rise by 0.5 m
4 million people affected
1,800 km² land submerged

Sea level rise by 1.5 m
8 million people affected
5,700 km² land submerged





What evidences of claiming climate change?

1. **Temperature is rising.**
2. **Melting Glaciers (Rapid sea ice loss)**
3. **Snow and rainfall patterns are shifting.**
4. **Rising the atmospheric CO_2 levels.**
5. **Extreme climate events – like heavy rainstorms, river flooding, worsening drought, and record high temperatures – are already happening.**
6. **The global mean sea level rising over the 20th century was 1.7 ± 0.2 mm/yr . This rate increased to 3.2 ±0.4 mm/yr since 1990, mostly because of increased thermal expansion and land ice contributions.**
7. **Ocean Acidification: The average pH of ocean surface waters has fallen by about 0.1 units, from about 8.2 to 8.1 (total scale) since 1765.**

Mitigation of Global Warming

- Adaption
  - Agriculture (Irrigation and adapted crops …)
- Conservation
  - Reduce energy needs
  - Recycling
- Alternate energy sources
  - Nuclear
  - Wind
  - Geothermal
  - Hydroelectric
  - Solar