



Sept 28: Major Consequences of Climate Change (water)

Update: Quiz 1, Student Feedback Summary, and Schedule Changes

Foci of the Day

- YouTube Video: Sea level rise & the impacts on NY City; Shrinking Aral Sea
- Shift of Water Level Global Lakes
- Great Lakes in a changing climate: algal blooms, frozen surface, snow fall, ET, *etc.*

Reading

Liu, Y., Chen, J., Sun, G., Zhang, G., Feng, J., & Fan, X. 2025. Catastrophic shifts in large lake levels. *Fundamental Research*, [5\(5\)](#):2084-2087



Students' Feedback

- 1) Pace:** good, a bit slow, too fast
- 2) Challenges:** math & physics, how and when to apply certain formulas to certain data;
- 3) Improvement:**
 - more videos;
 - more guidance for studying quizzes and exams;
 - more time on difficult topics;
 - Use more examples of how concepts are applied;
 - more practice with using all the formulas.



Updated Schedule

Sep 28, 2026: Major Consequences of Climate Change (water) Quiz 1, Student Feedback Summary, and Schedule Changes YouTube Video: Sea level rise & the impacts on NY City; Shrinking Aral Sea Shift of Water Level Global Lakes Great Lakes in a changing climate: algal blooms, frozen surface, snow fall, ET, etc. Reading: Liu, Y., Chen, J., Sun, G., Zhang, G., Feng, J., & Fan, X. 2025. Catastrophic shifts in large lake levels. Fundamental Research, 5(5):2084-2087[PDF]	PDF
Sep 30, 2026: Southern Oscillation (ENSO) What are El Niño and La Niña? How often does ENSO occur? How will ENSO impact a particular region? What is the Southern Oscillation Index (SOI)? El Niño/La Niña Update (August 2026) -- WMO Reading: NOAA, El Niño Southern Oscillation (ENSO); https://psl.noaa.gov/enso/?utm_source=chatgpt.com WMO on El Niño (9/3/2026); https://wmo.int/resources/publication-series/el-ninola-nina-updates/august-2026	PDF
Oct 5, 2026: Climate Extremes & Effects Summary from IPCC (2021) Case studies (Gu et al. 2007; Grant et al. 2025) In class exercises	PDF



1) Warming trend and spatial variability

2) Direct impacts:

- Sea turtle
- Biodiversity
- Global ecosystem WUE
- Sea level rises, and
- Shrinking Aral Sea)
- Dairy production in Kazakhstan



Field Impressions



Field Impressions



Field Impressions



Field Impressions



Field Impressions





Field Impressions





Field Impressions





Field Impressions





Field Impressions





Field Impressions





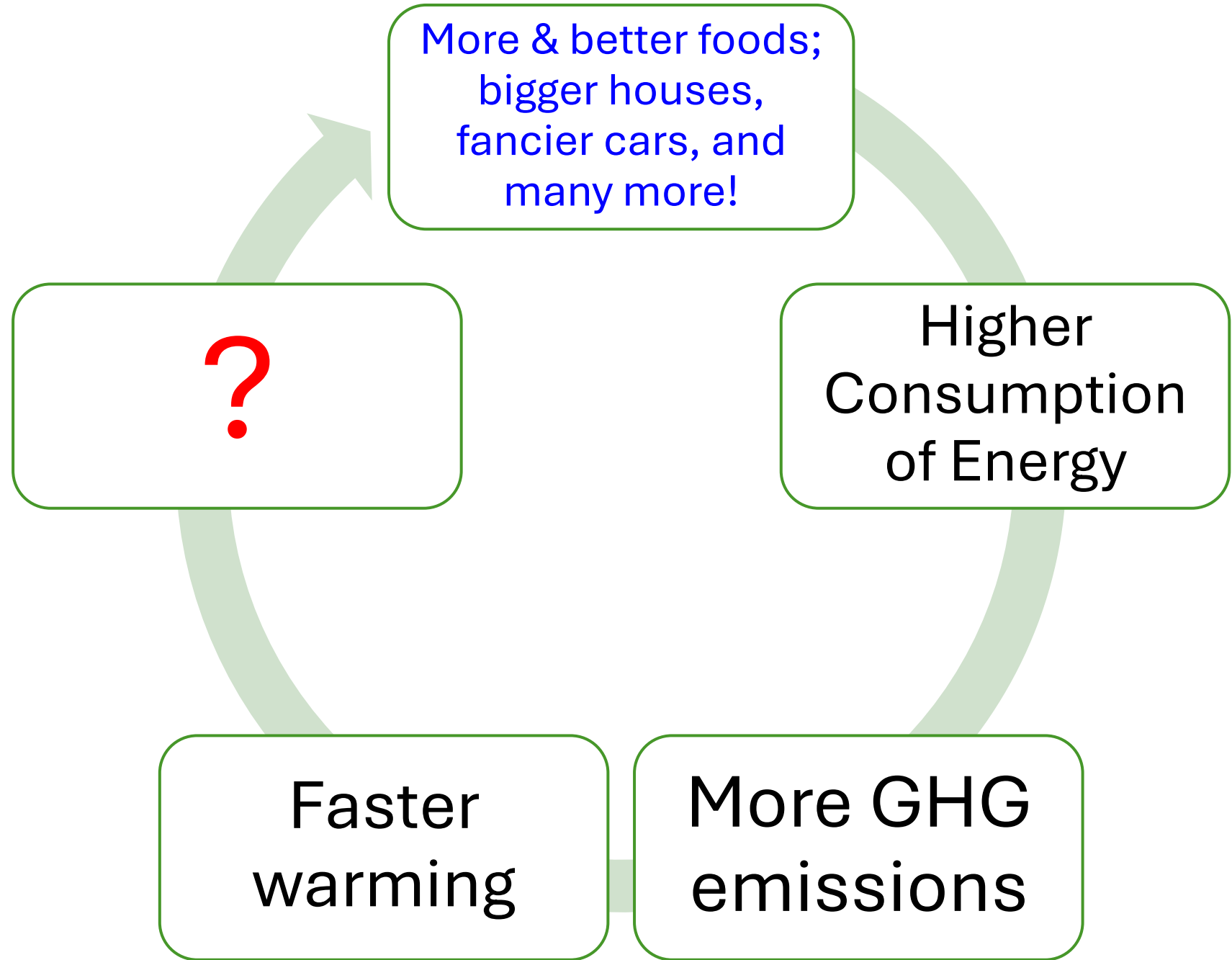
Field Impressions





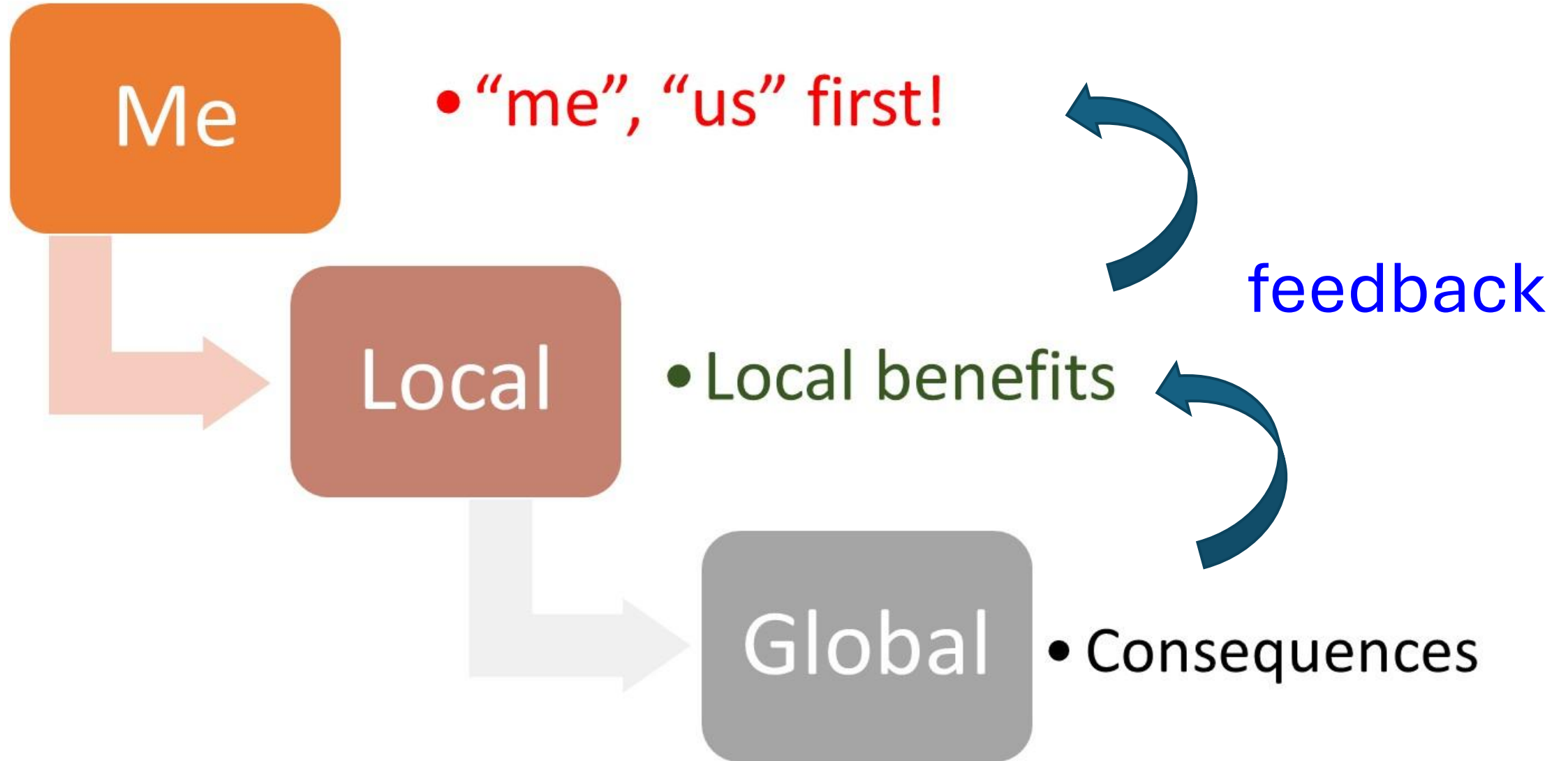
Human Nature

- A positive feedback
- System collapses, eventually





Human ~ Nature: A dangerous loop

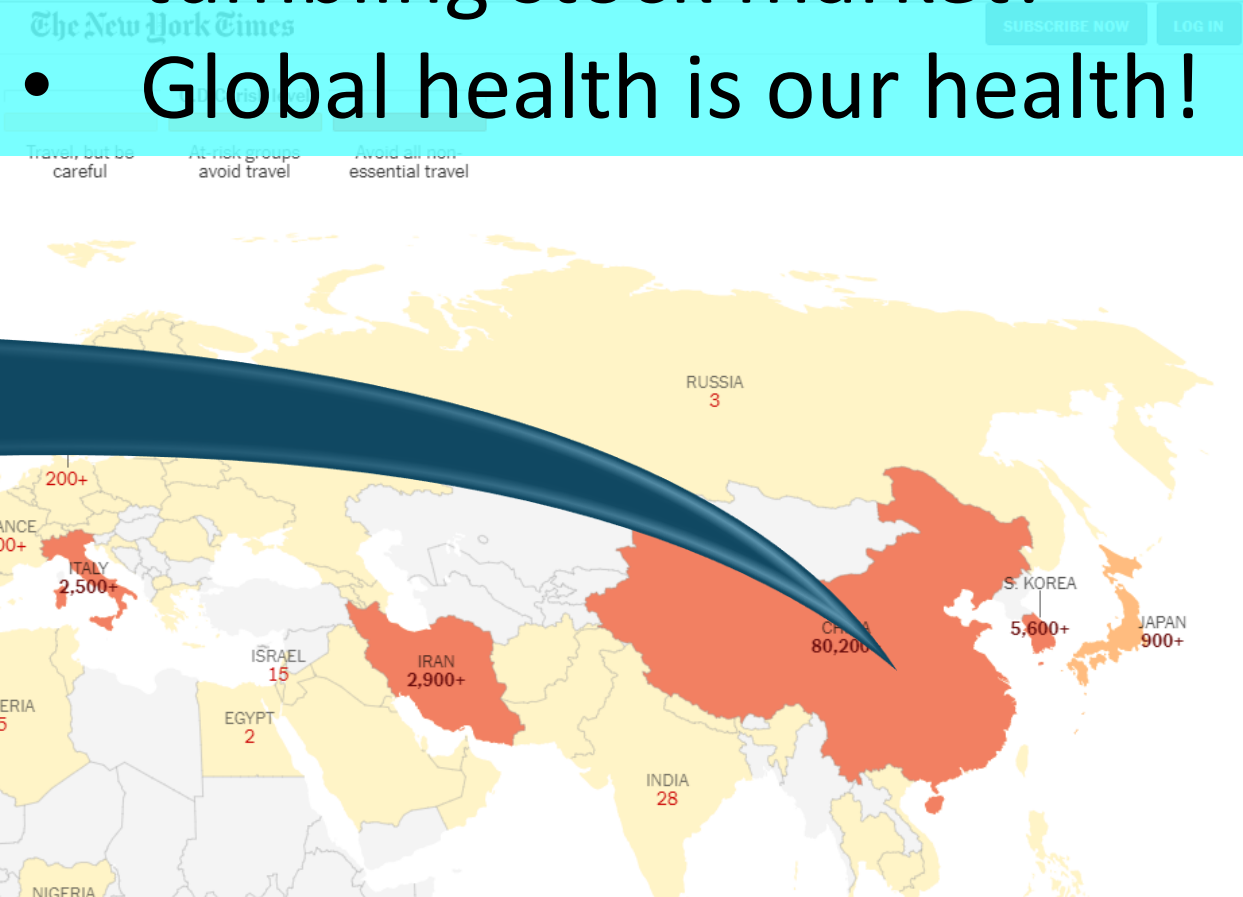


What happens in one place can have effects elsewhere around the world!

Coronavirus concerns: Shelves emptied of face masks, sanitizer



- Not mentioning the tumbling stock market!
- Global health is our health!





Take-Home-Messages

- 1) The major changes in global climate include rising temperatures and altered precipitation patterns at local, regional, and global scales.
- 2) These changes have both direct and indirect impacts on natural ecosystems, people, and societies.
- 3) Of particular concern are the potential positive feedbacks that could accelerate climate change.



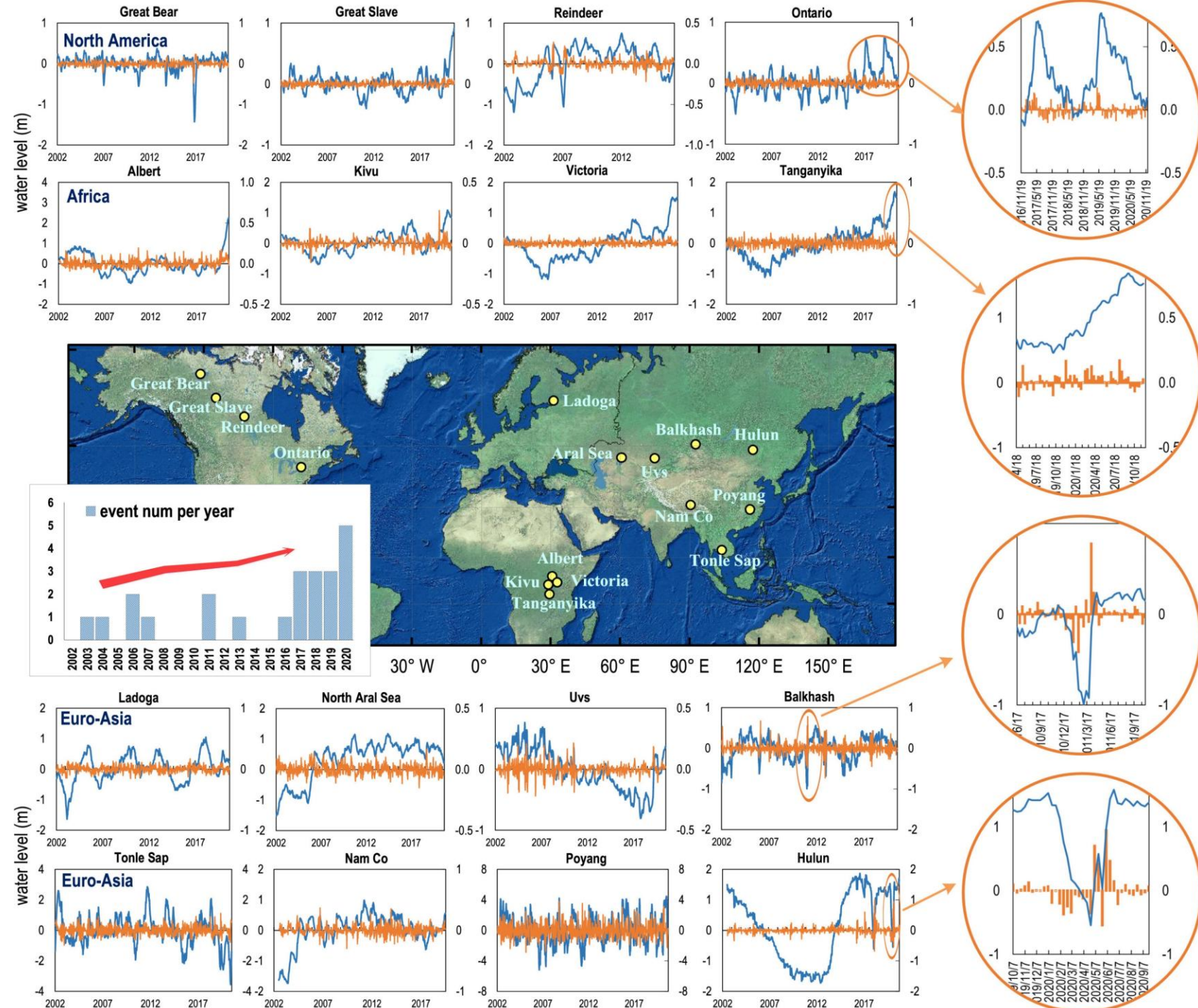
Oct 13: Major Consequences of Climate Change: Lakes

- Shift of Water Level
Global Lakes
- Great Lakes in a changing climate: algal blooms, frozen surface, snow fall, ET, etc.





Water level fluctuations for large lakes on the N. American, African, and Eurasian continents during 2002-2020.



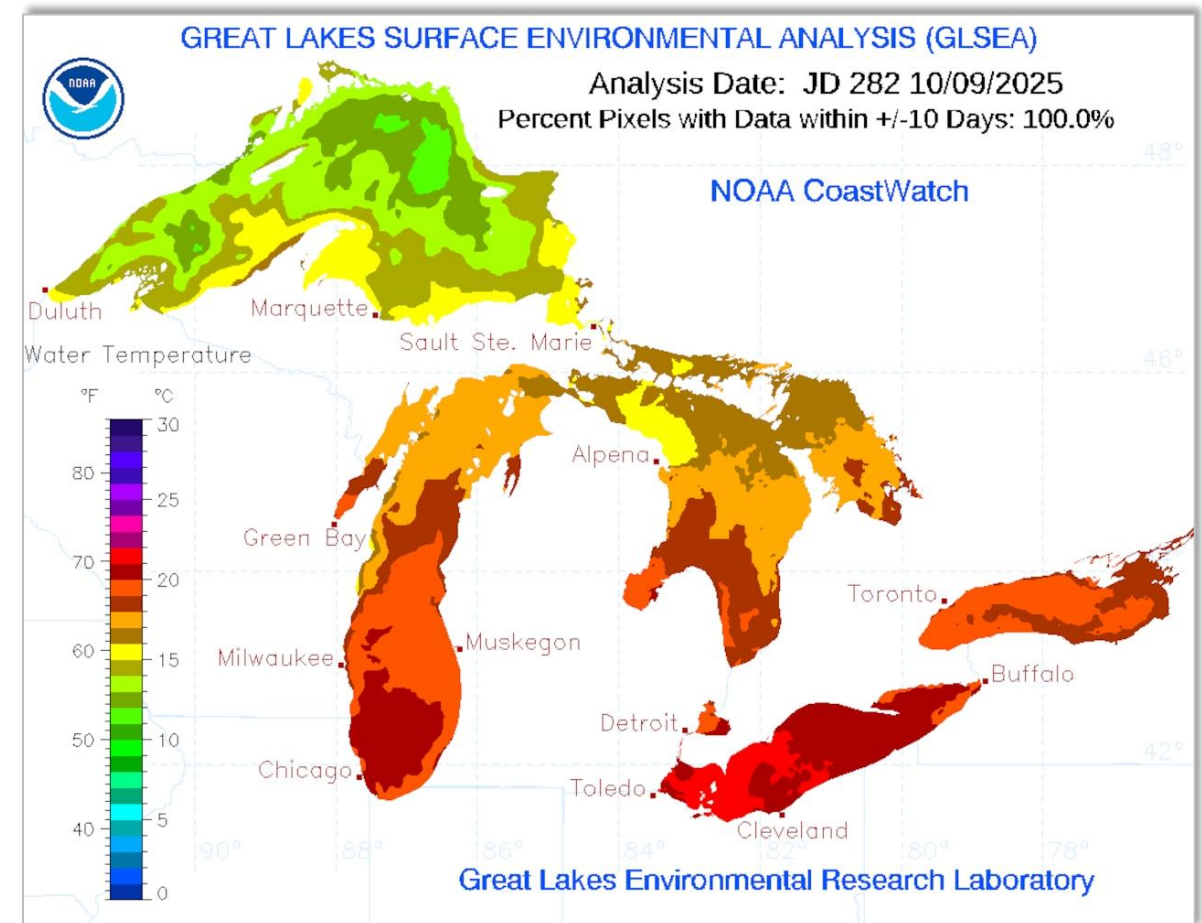
Liu, Y., Chen, J., Sun, G., Zhang, G., Feng, J., & Fan, X. 2023. Catastrophic shifts in large lake levels. *Fundamental Research*, [5\(5\)](#):2084-2087



Lake Michigan water temperature: Record warmth could impact winter weather

(<https://www.mlive.com/weather/2025/10/lake-michigan-water-temperature-record-warmth-could-impact-winter-weather.html>)

- Lake Michigan right now has an overall surface temperature of 65.6 °F. The long-term average surface water temperature for Oct. 9 is 59.4 °F.
- This means Lake Michigan is now 6.2 °F warmer than the long-term average.

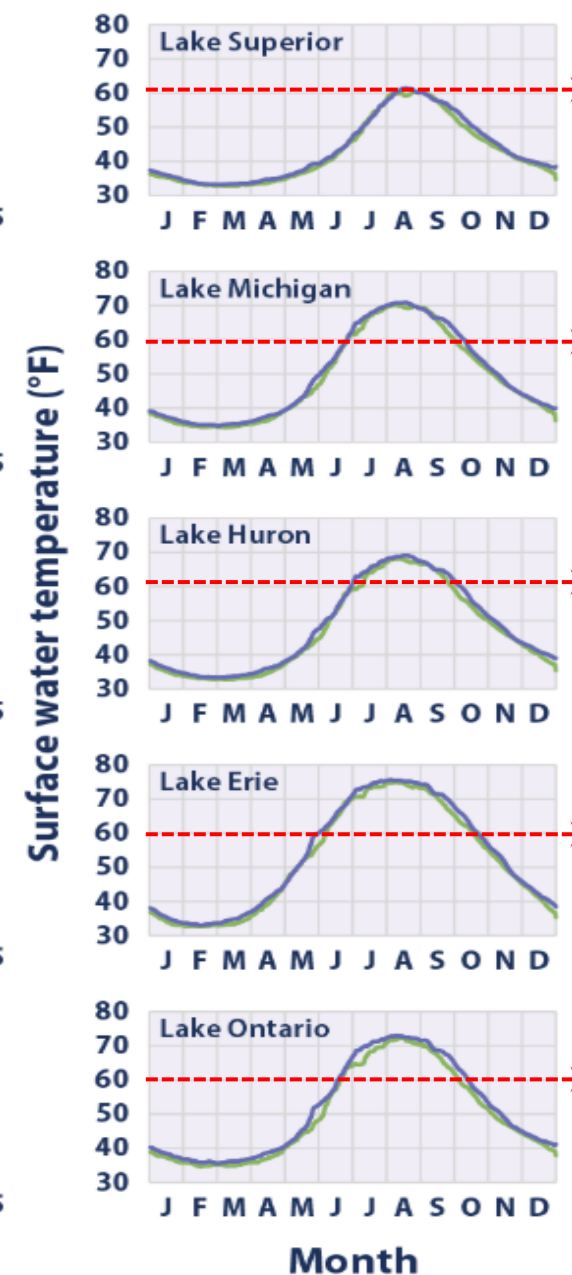
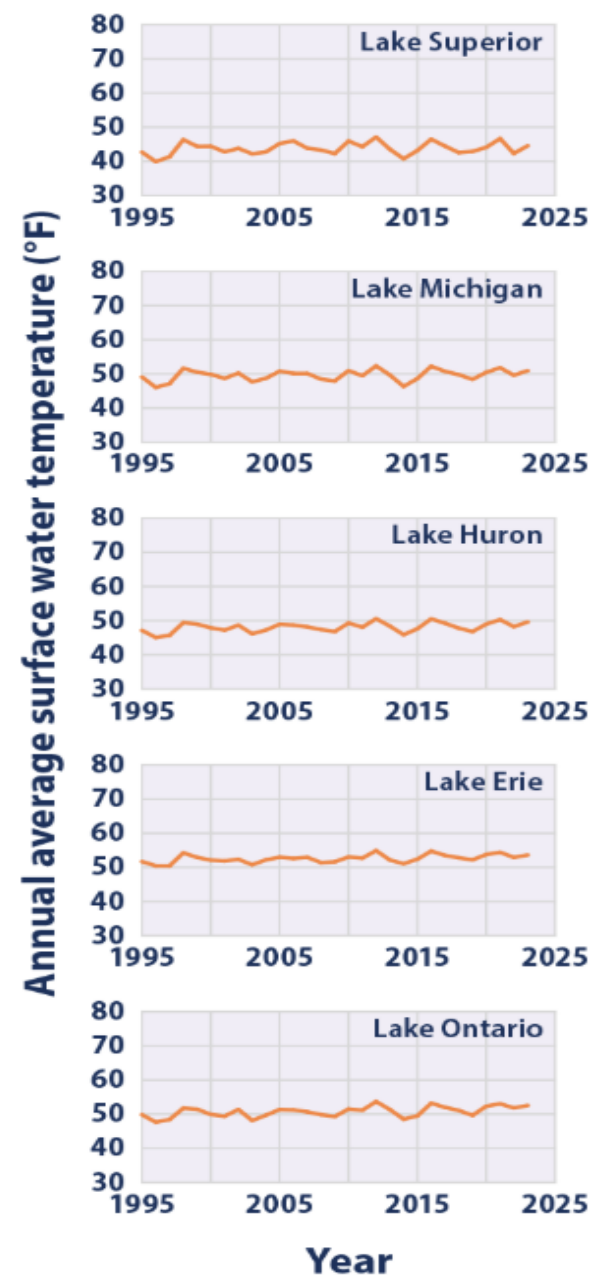




Climate Change Indicators: Great Lakes Water Temperatures

(<https://www.epa.gov/climate-indicators/great-lakes>)

- Stable compared with terrestrial land surface temperature, with **slight** warming trend
- Lake Erie has the highest temperature due to:
 - 1) low latitude;
 - 2) shallow water



Climate Change Indicators: Great Lakes Water Level

(<https://www.epa.gov/climate-indicators/great-lakes>)

Highly variable lake level over year and by lake

Lake Michigan

-3 m to +3.5 m

Low during 2000-2012

Lake Erie

Lowest in 2014 after a decade

Lowest in the mid-1930s

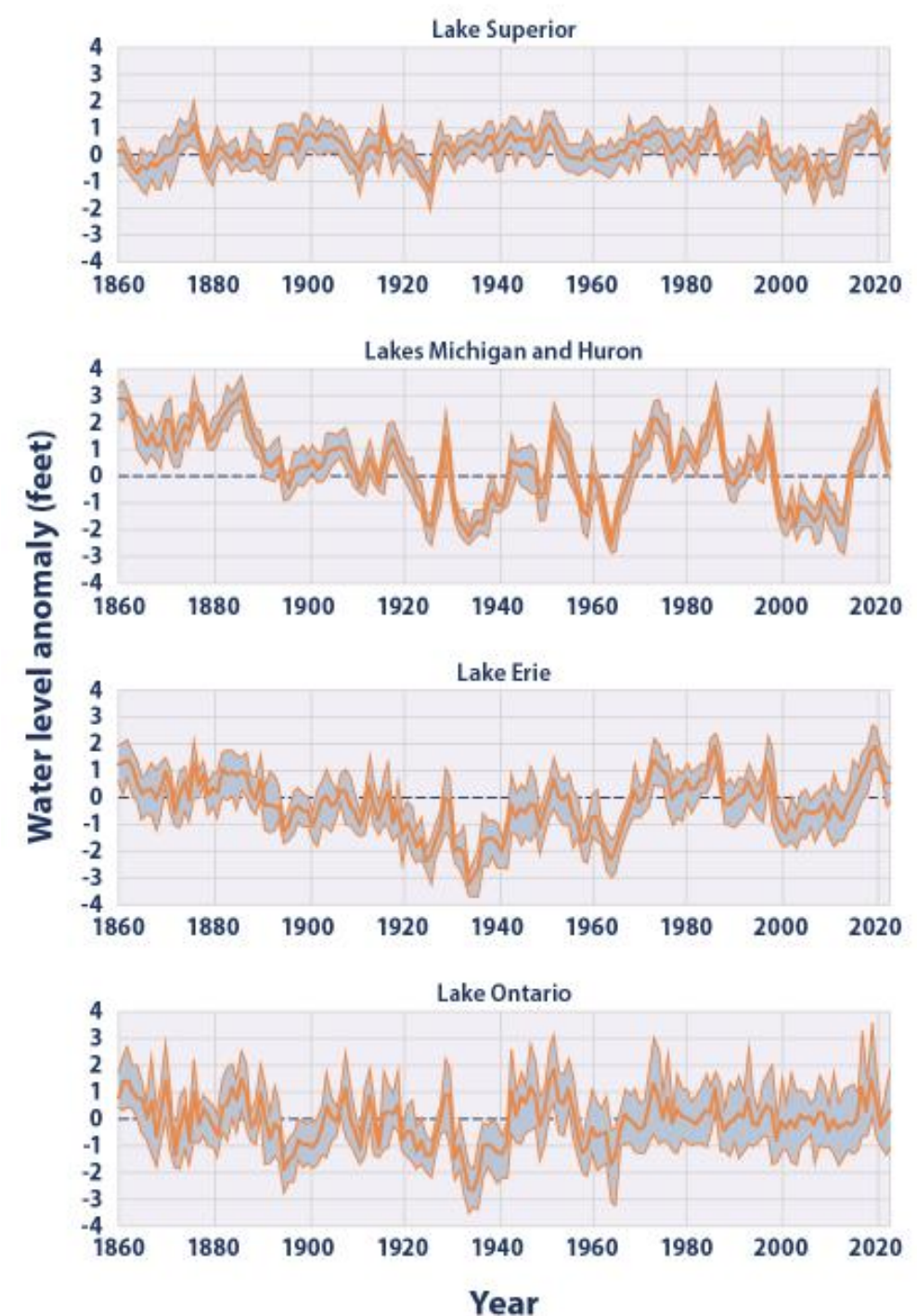
Lake Superior

Very stable

Lake Ontario

Stable since 1960

Reference: <https://seagull.glos.org/map?coords=-83.6466995%2C44.3707460%2C5>



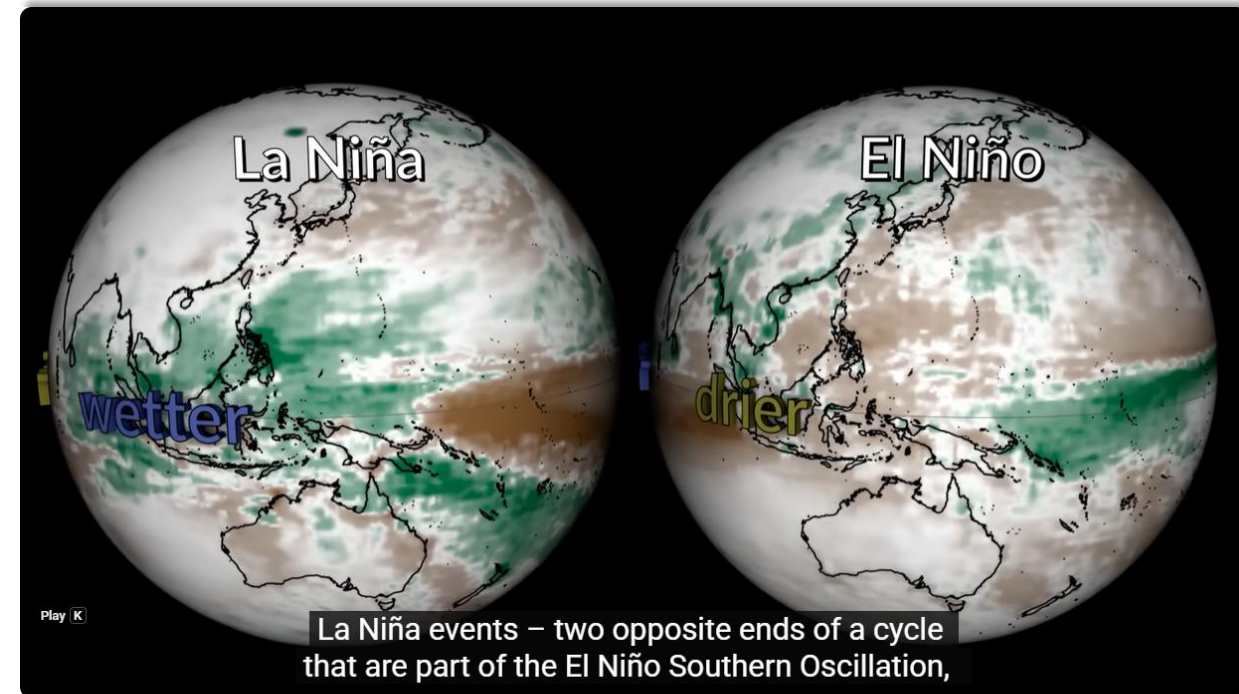


Sept 30 Southern Oscillation (ENSO)

Foci of the Day

- What are El Niño and La Niña?
- How often does ENSO occur?
- How long does ENSO last?
- How will ENSO impact a particular region?
- What is the Southern Oscillation Index (SOI)?
- El Niño/La Niña Update (August 2026) -- WMO

<https://www.youtube.com/watch?v=sabLh0F0rzA>



Climate change

United Nations • Climate change refers to long-term shifts in temperatures and weather patterns. Human activities have been the main driver of climate change, primarily due to the burning of fossil fuels like coal, oil and gas.

Reading

NOAA, El Niño Southern Oscillation (ENSO); https://psl.noaa.gov/enso/?utm_source=chatgpt.com

WMO on El Niño (9/3/2026); <https://wmo.int/resources/publication-series/el-ninola-nina-updates/august-2026>