

# **STATE OF THE EARTH: SOME VERY WORRYING TRENDS IN GLOBAL WARMING**

*by*

**G. Warfield “Skip” Hobbs**  
*Geologist, Farmer and Conservationist*

*Yale 1969 Class Reunion*

*May 31, 2024*

A panoramic view of a city at night, likely Hong Kong, with numerous skyscrapers illuminated with blue and white lights. The city is situated on a peninsula with a large body of water in the foreground. The sky is dark with some clouds.

## **ENERGY AND CLIMATE CHANGE**

***Cheap and abundant fossil fuels  
have energized America  
And the world's economies.***

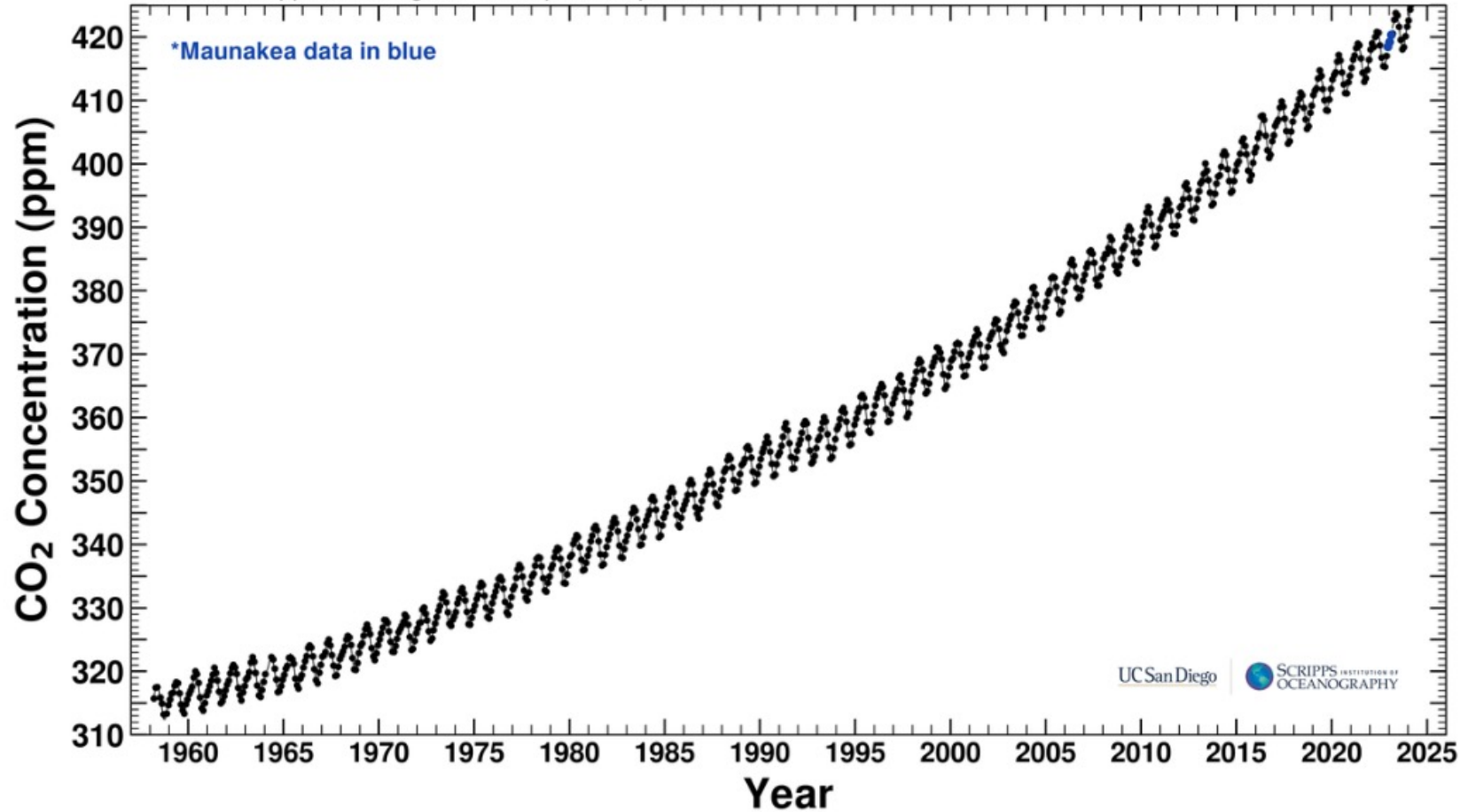
A photograph showing several tall, dark industrial smokestacks. Each stack is emitting a thick, billowing plume of dark, greyish-brown smoke that rises into the sky. The smoke plumes are dense and layered, creating a hazy, overcast atmosphere. The background is a pale, overcast sky. The overall scene conveys a sense of industrial activity and environmental impact.

***The traditional business model  
must change for the  
good of planet earth.***

# ATMOSPHERIC CO<sub>2</sub> AT 427 PPM APRIL 2024

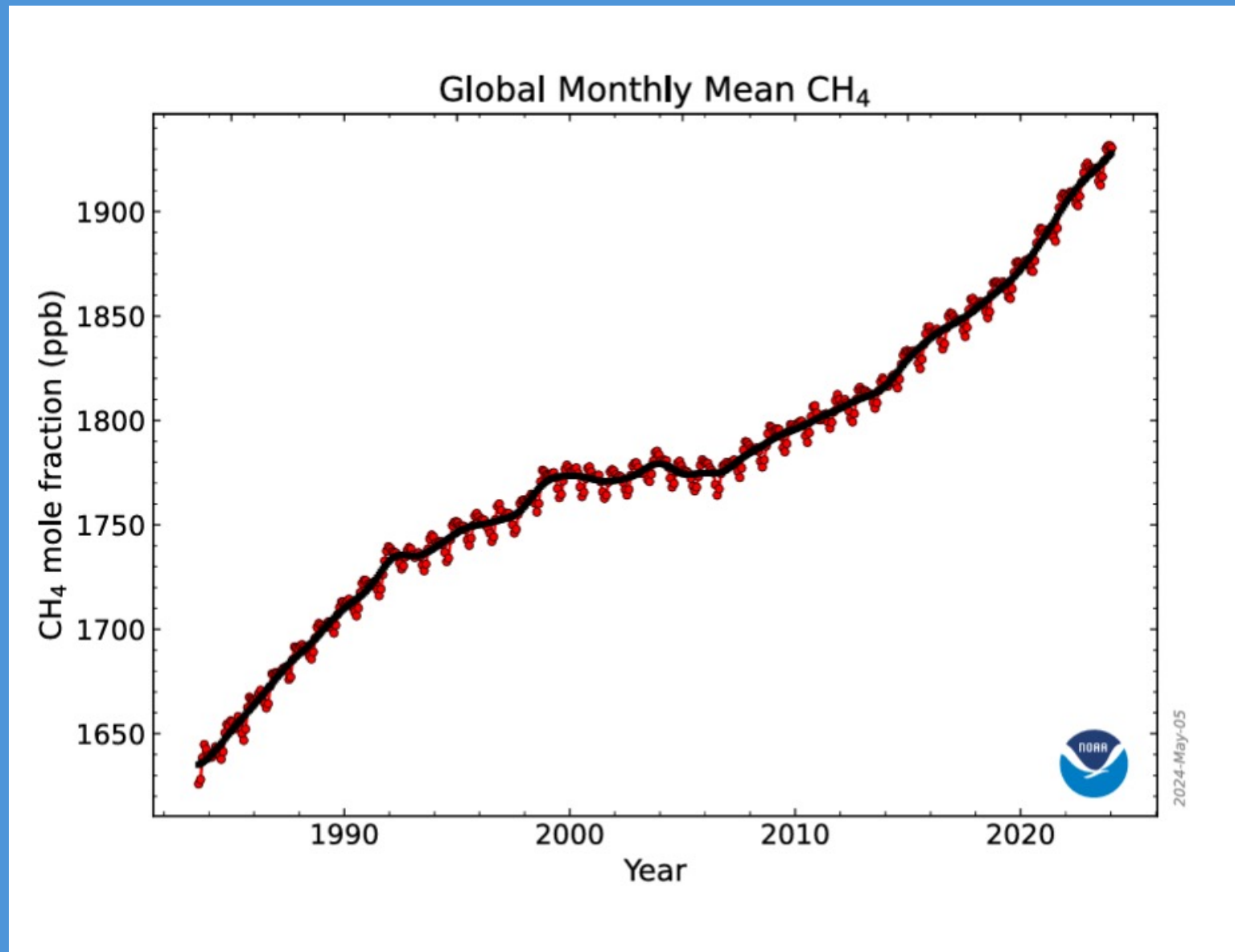
## Mauna Loa Observatory, Hawaii\* Monthly Average Carbon Dioxide Concentration

Data from Scripps CO<sub>2</sub> Program Last updated April 2024

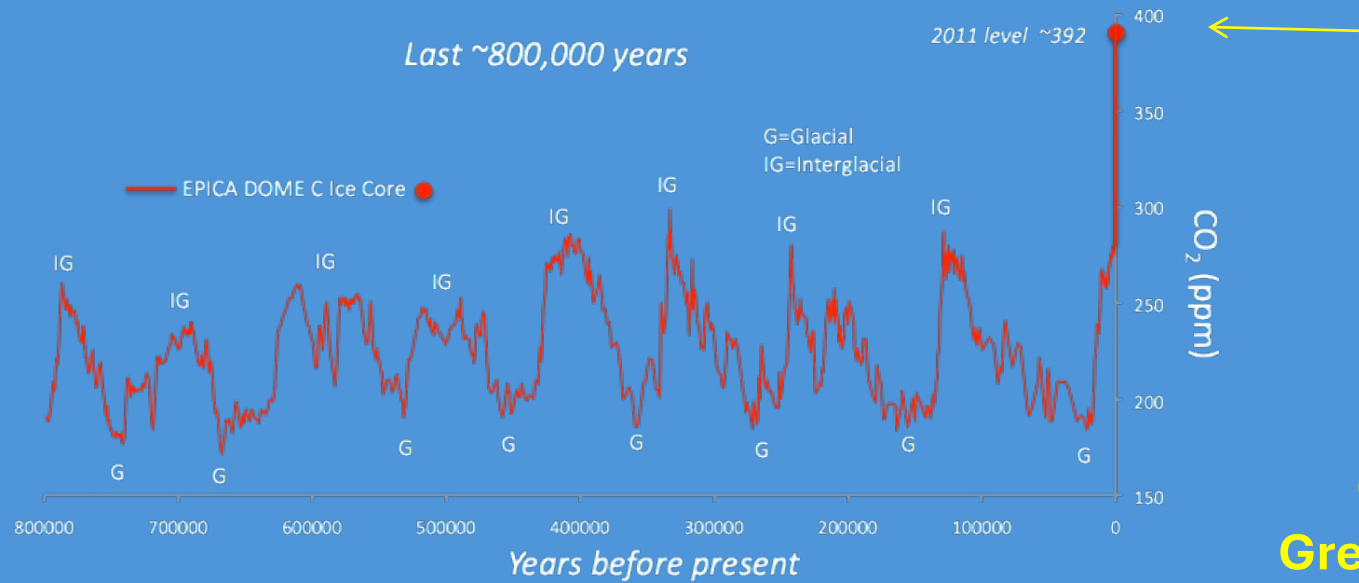


**CO<sub>2</sub> now 50% higher than preindustrial levels and the highest in at least 4.3 Million years**

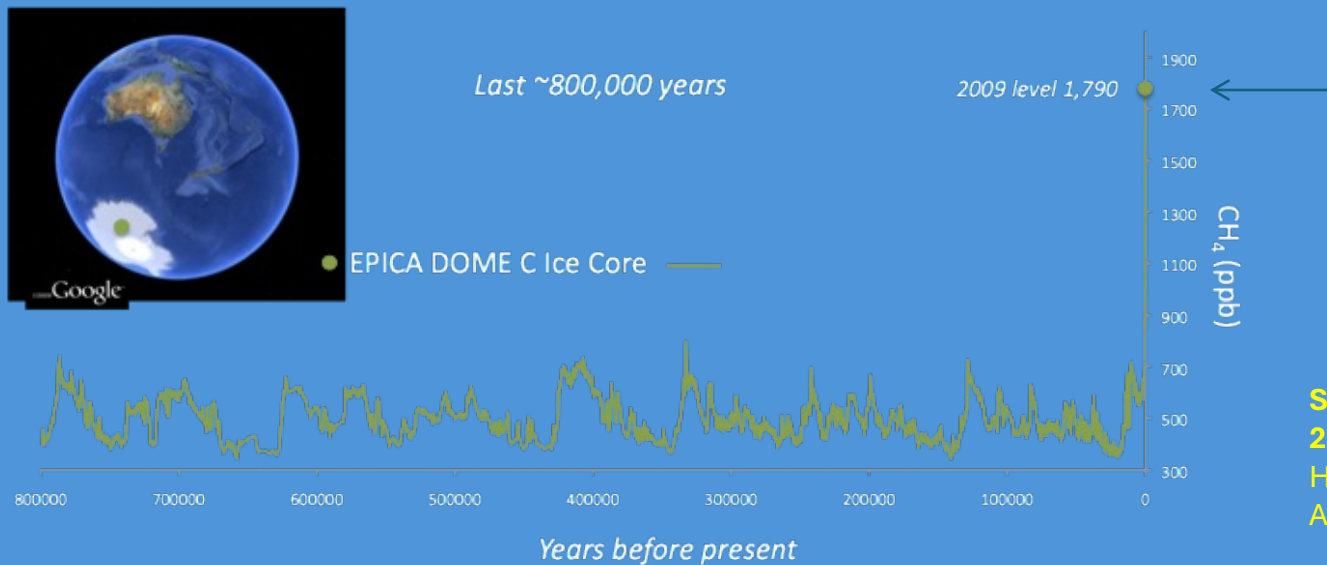
# GLOBAL ATMOSPHERIC METHANE MAY 2024



# ANTARCTIC ICE CORE DATA

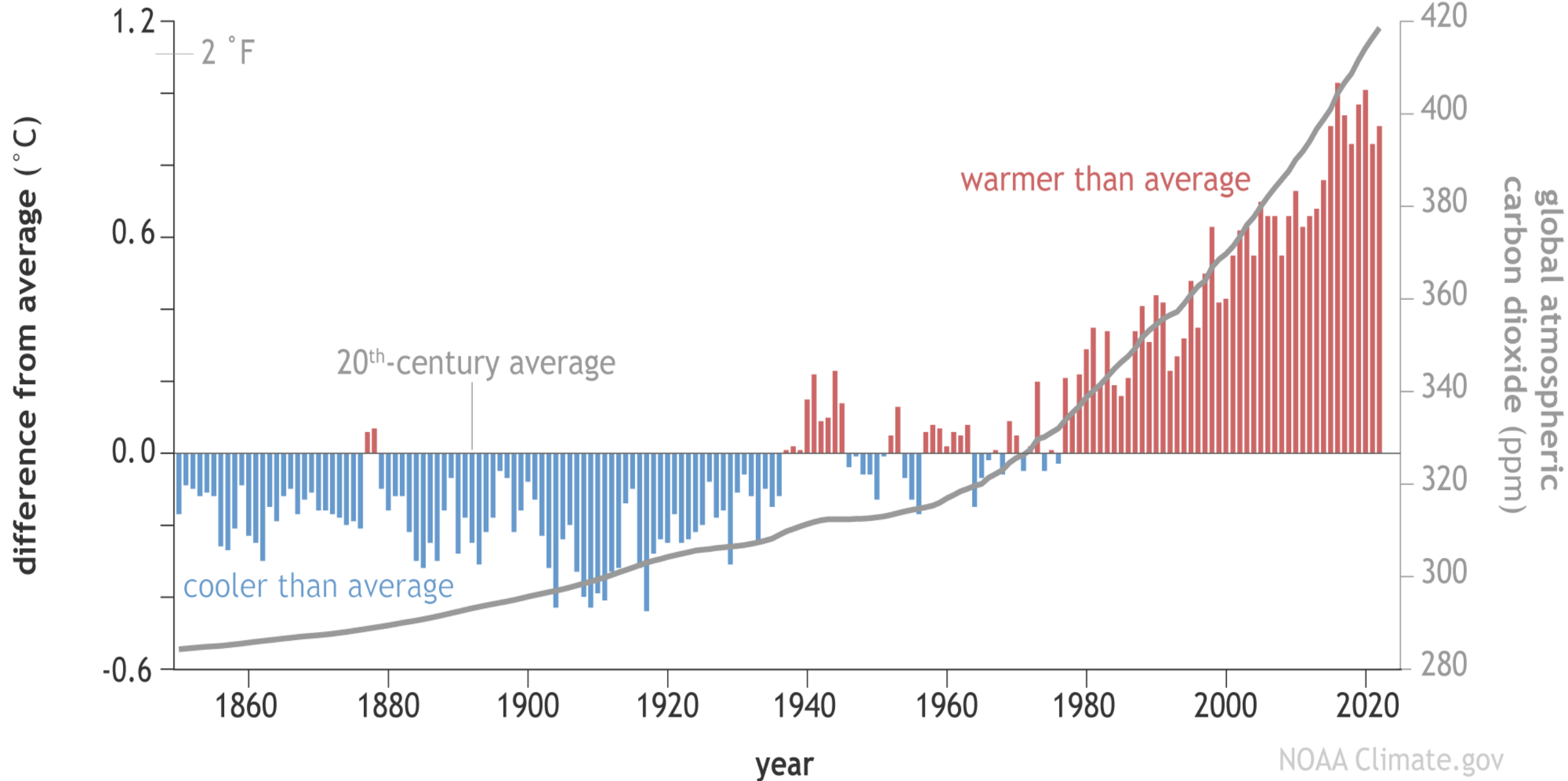


**CO<sub>2</sub> and CH<sub>4</sub>  
Greenhouse Gases  
At 800,000 year peak**



**Source: NOAA, Elsig, J. et al,  
2009 EPICA Dome C Ice Core  
Holocene d13CO<sub>2</sub> Data-  
Antarctica**

# Yearly global surface temperature and atmospheric carbon dioxide (1850-2022)



# IT'S GETTING HOT OUT THERE !

## Heat Vaporizes September Record

Last month set the September temperature record by the highest-ever margin

✦ Copernicus (ERA5) ✦ Japan Meteorological Agency (JRA-55)



Source: Zeke Hausfather  
Temperatures represent the amount of warming above a 1850-1900 baseline.  
1C=1.8F

Bloomberg

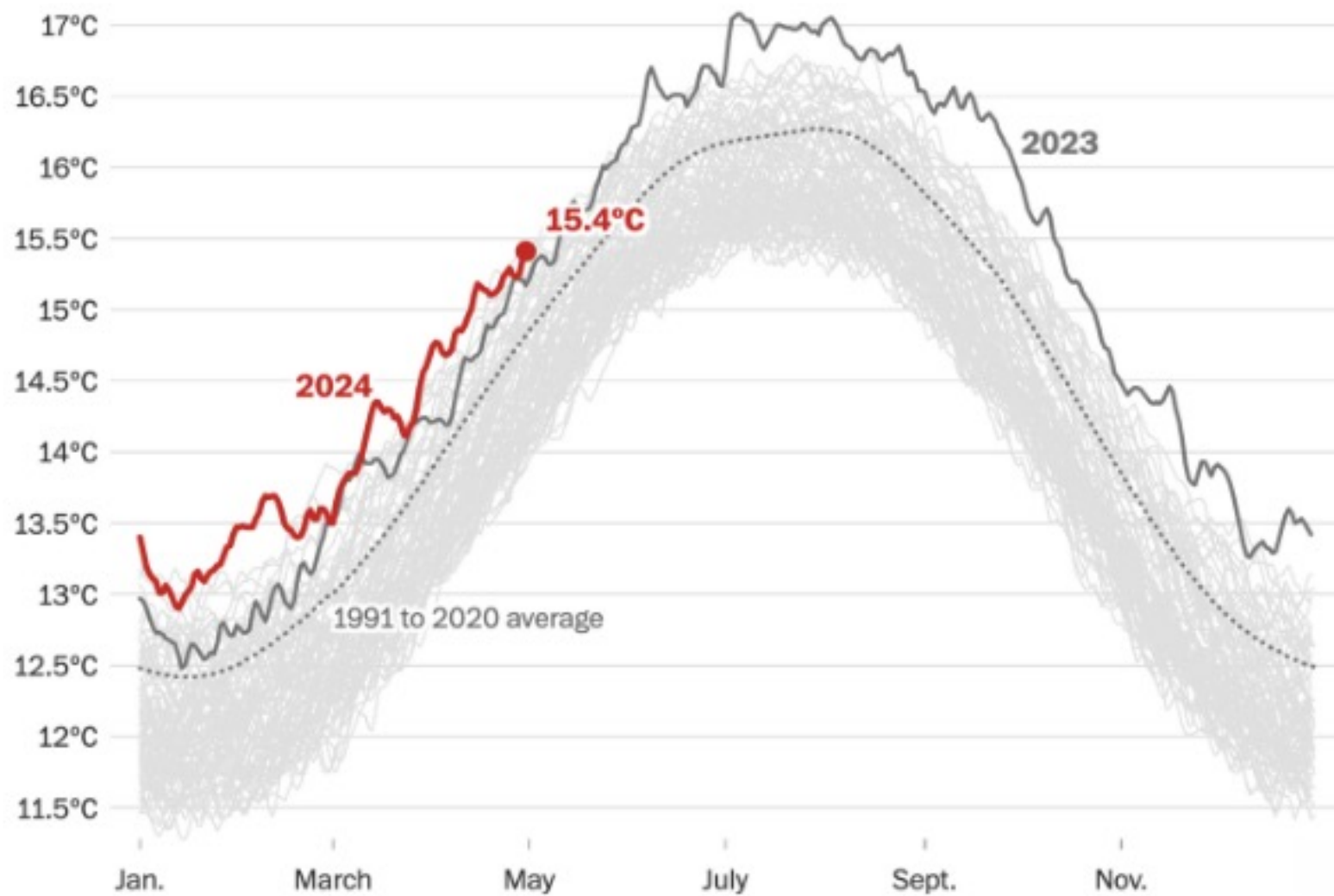
**September 2023 global temperatures shattered Previous records by more than 0.5°C (0.9°F) by the largest monthly margin ever observed.**

**= Impact of both human-caused global warming And new El Nino event.**

**2023 was the hottest year On record – close to 1.5° Above Pre-industrial average**

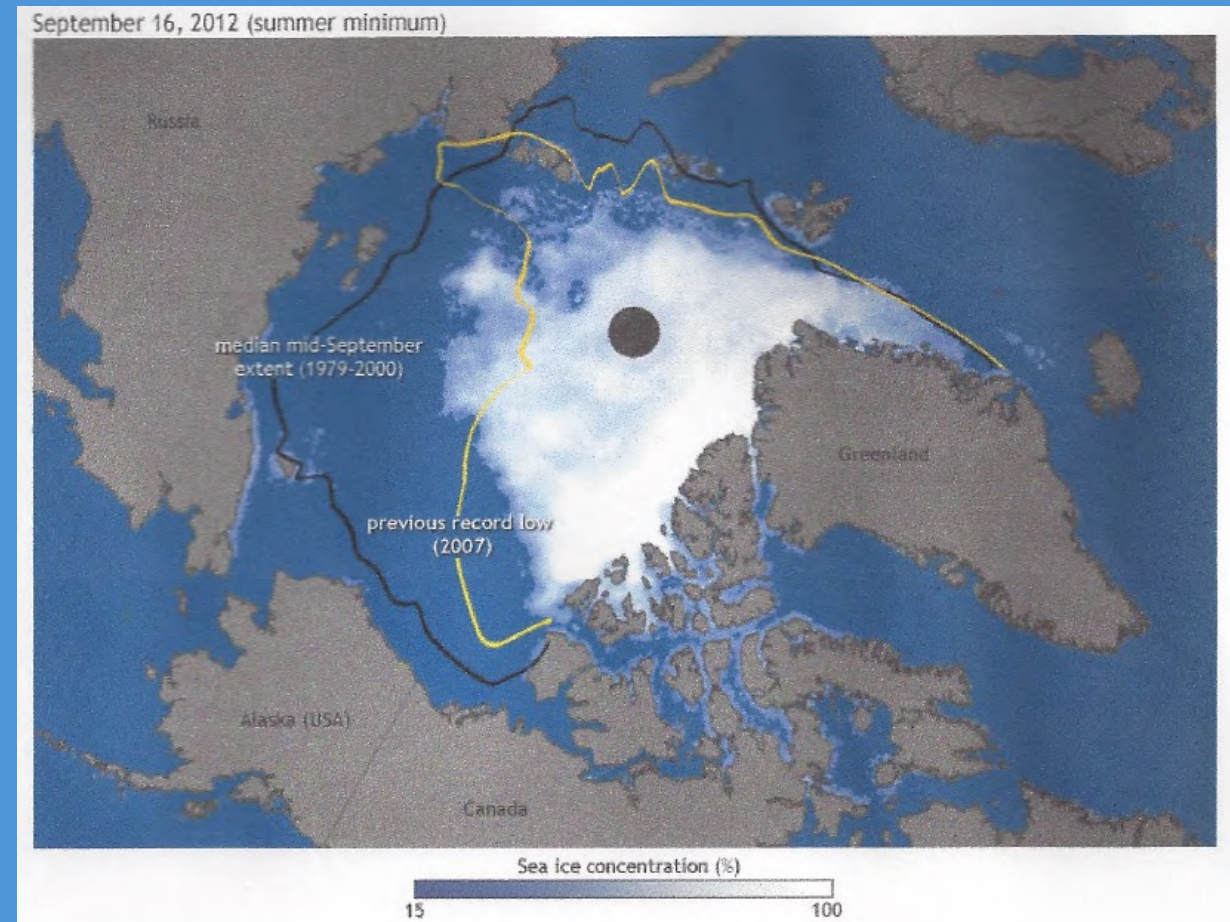
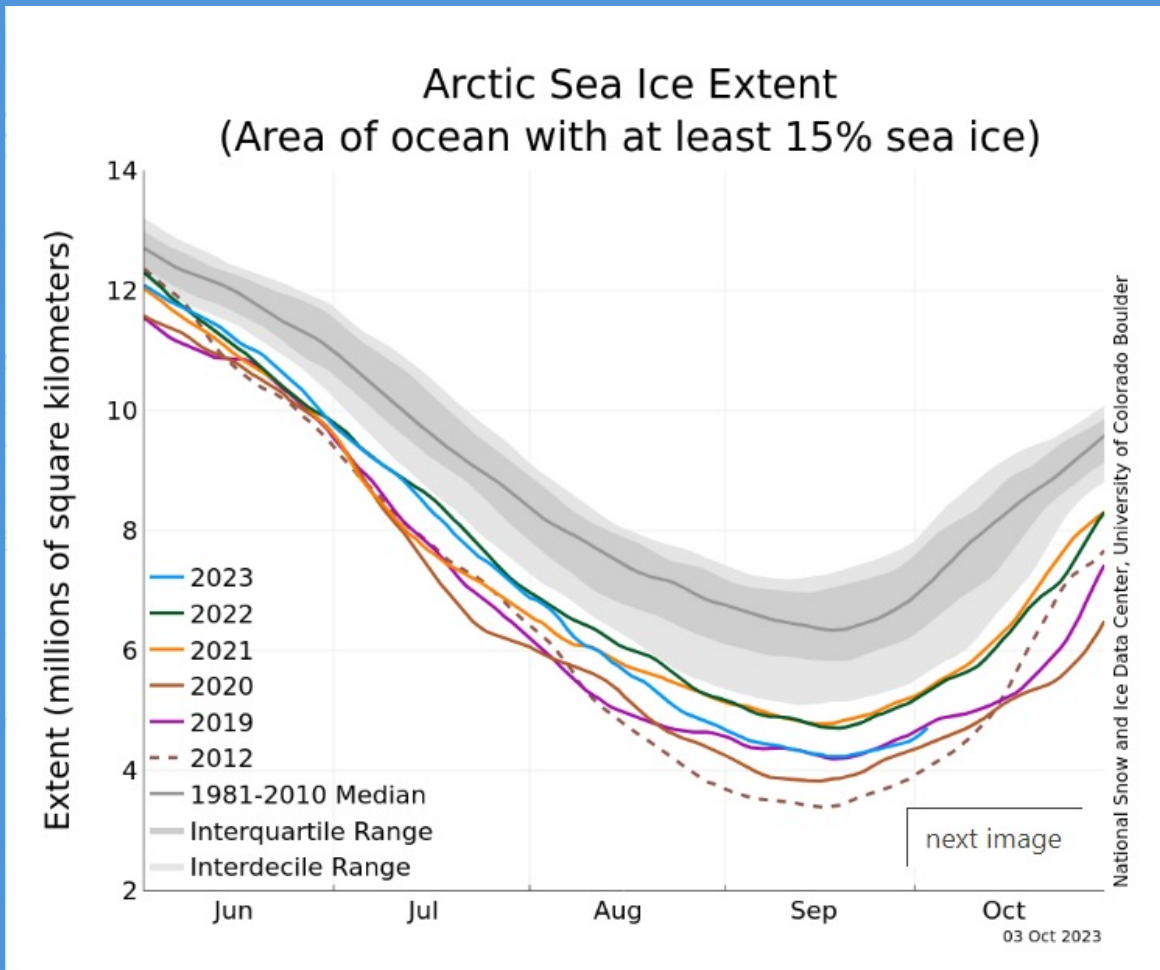


**5** Last month was the hottest April on record.



Data is from Copernicus Climate Change Service through April 30. (John Muyskens/The Washington Post)

# THE ARCTIC IS MELTING



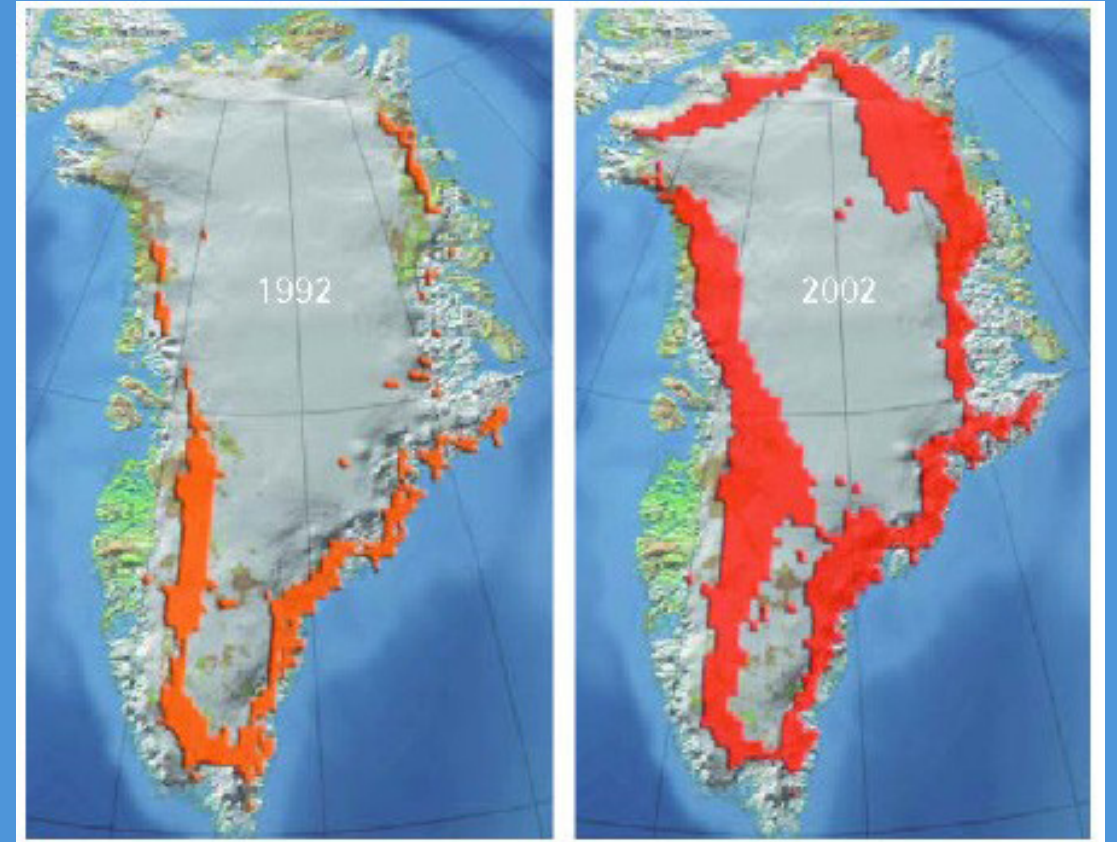
**2012 WAS  
THE WORST YEAR SO FAR**

Source: National Snow & Ice Data Center

# Greenland's Glaciers are Melting (5,091 km<sup>2</sup> since 1985)



**Resulting in sea level rise and  
possible shift of Gulf Stream**



**PERMAFROST IS MELTING IN ALASKA**



**Computer model?**



Patricia Oksoktaruk Lillie



**Alaska is warming at around twice the rate of the rest of the United States. The average annual air temperature has risen 6.1° F (3.4° C) in the past 50 years, while winters have warmed by 11.3° F (6.3° C).<sup>2-3</sup>**

## **ANTARCTIC ICE SHEETS ARE MELTING !**



**The collapse of Thwaites Glacier could raise sea level by several feet.**

**Melting of West Antarctica ice sheets could raise sea levels by 5.3 m or more than 17 feet**

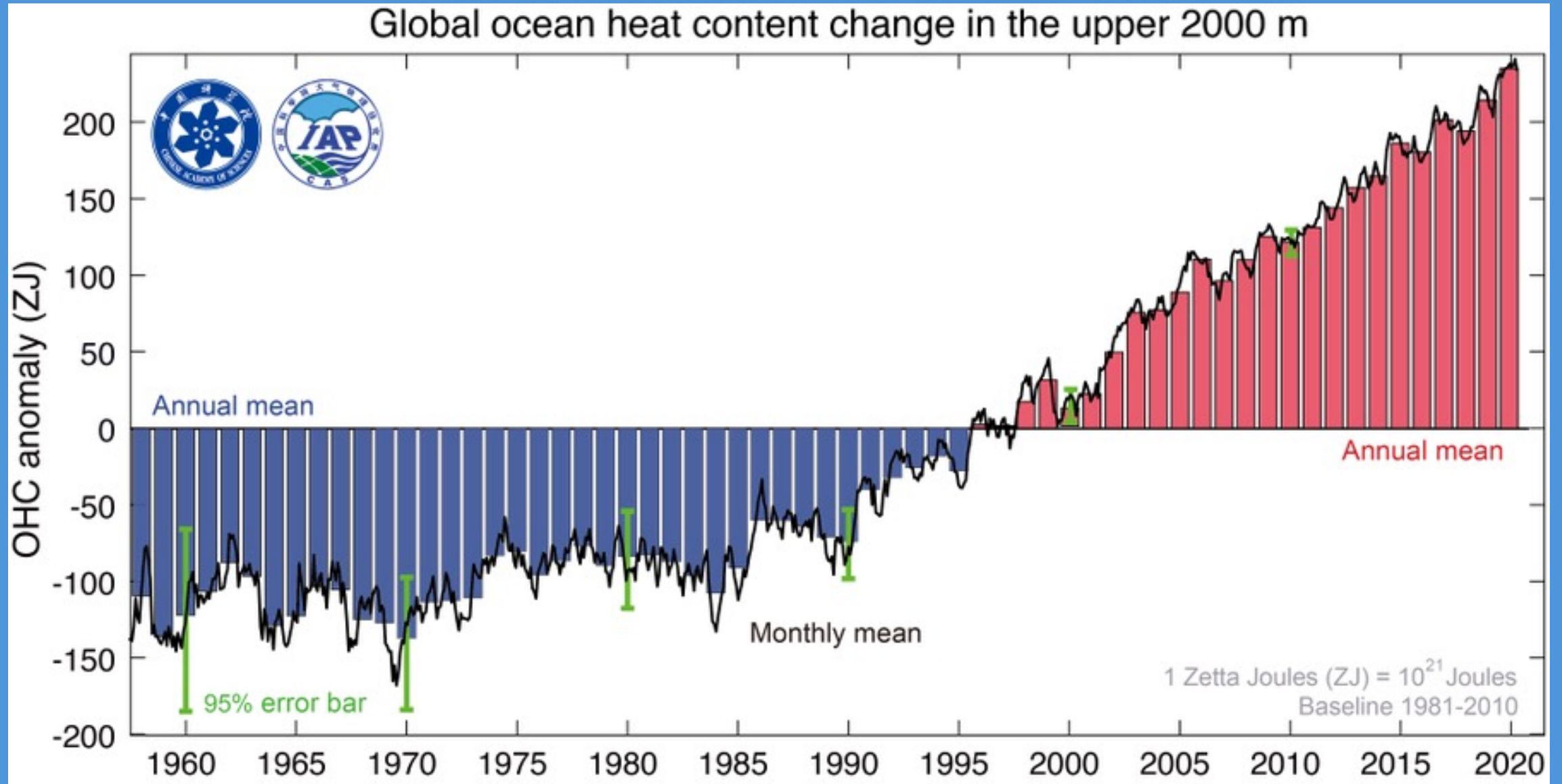
## Warm Arctic, Cold Continents: A Common Pattern Related to Arctic Sea Ice Melt, Snow Advance, and Extreme Winter Weather

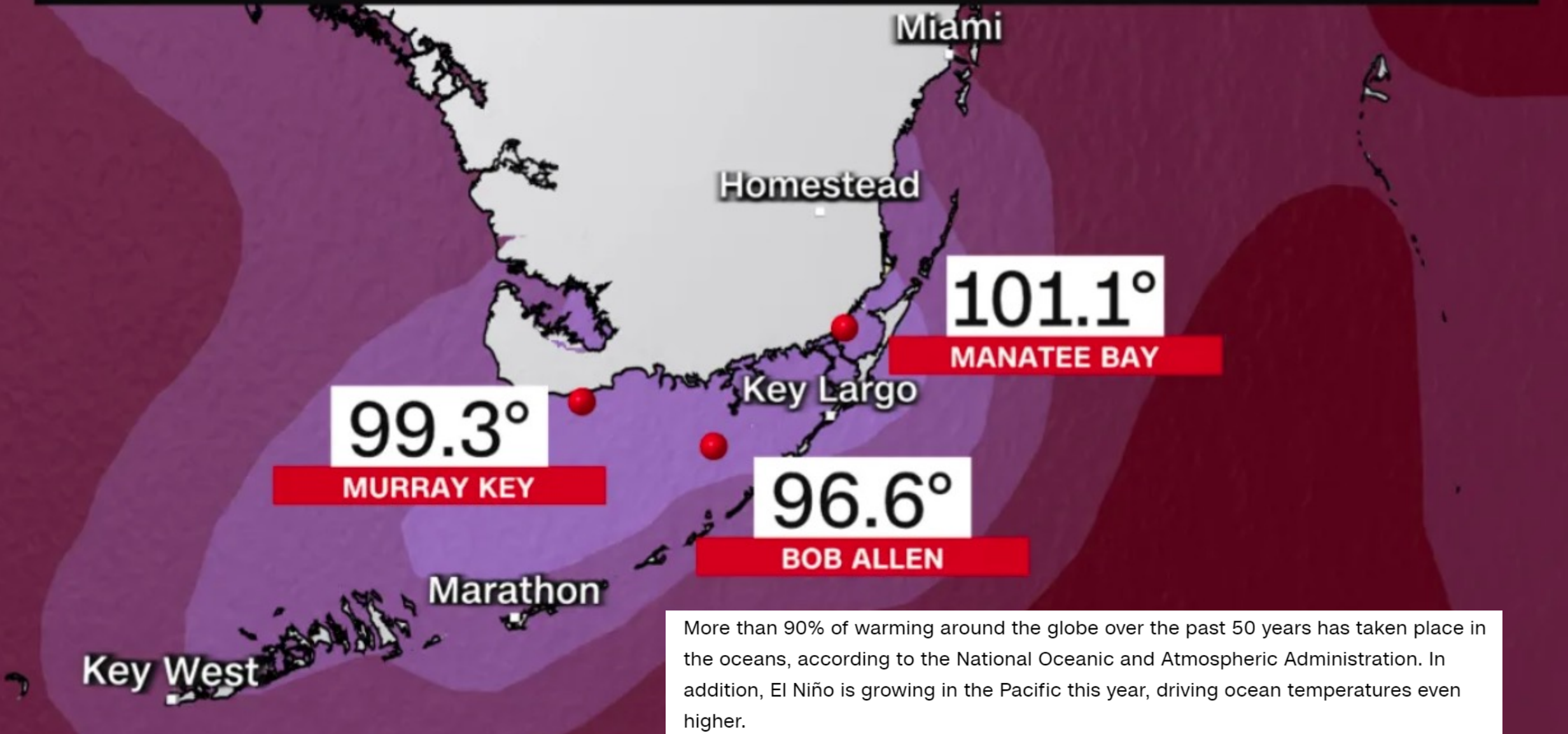


Rising global average temperatures, and especially intense warming in the northern polar regions, are leading to a rapid loss of the sea ice cap that covers the Arctic ocean. Emerging research may indicate that large losses of Arctic sea ice cover can have dramatic impacts upon weather patterns across the heavily populated northern mid-latitudes, and that such impacts could increase as ice cover continues to retreat in the coming decades.

*Source: National Academies 2013*

# 90% OF GLOBAL HEAT IS ABSORBED BY THE OCEANS

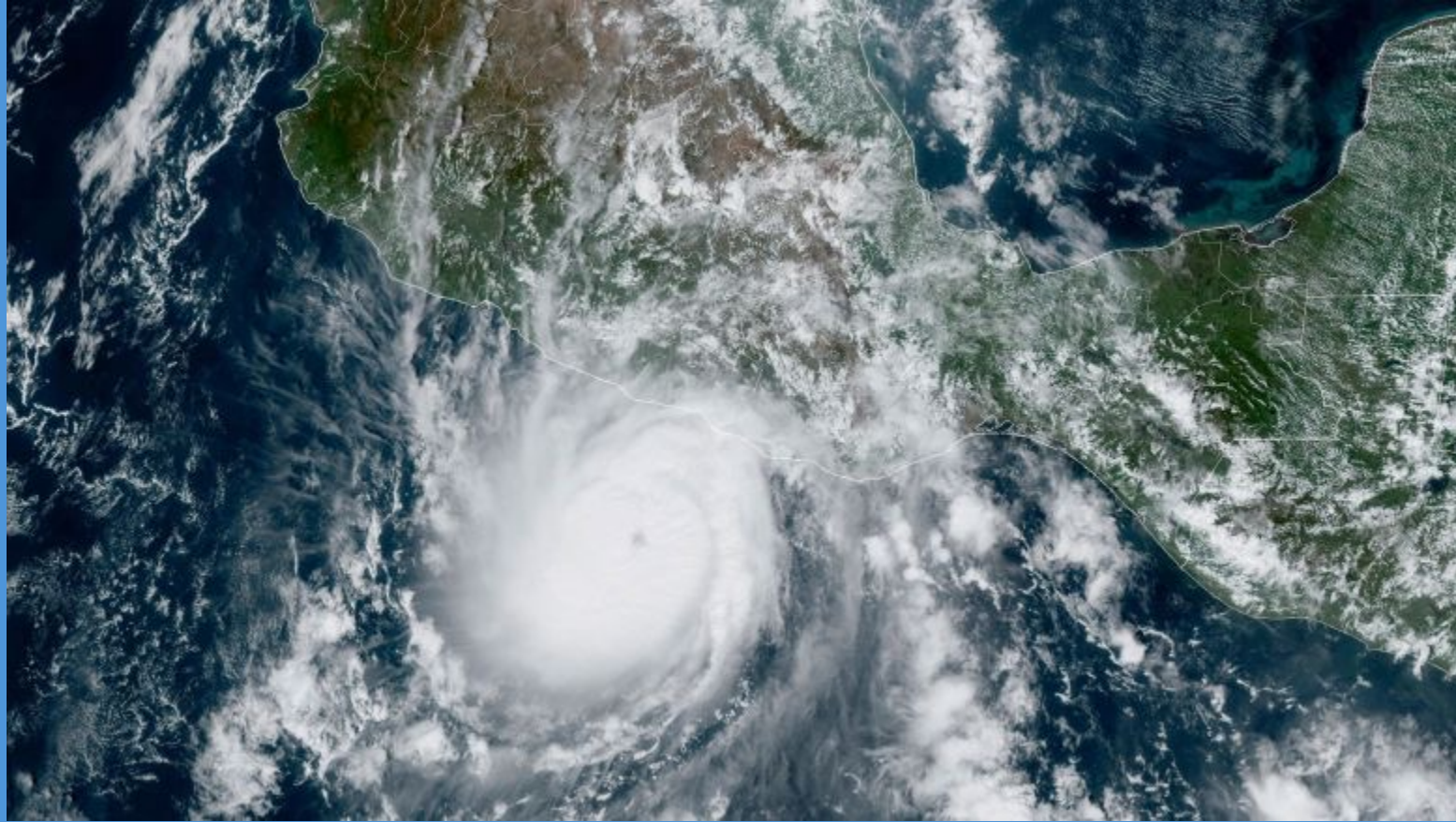




More than 90% of warming around the globe over the past 50 years has taken place in the oceans, according to the National Oceanic and Atmospheric Administration. In addition, El Niño is growing in the Pacific this year, driving ocean temperatures even higher.



## **Hurricane Otis hits Mexico with 165 MPH Winds October 25, 2023**

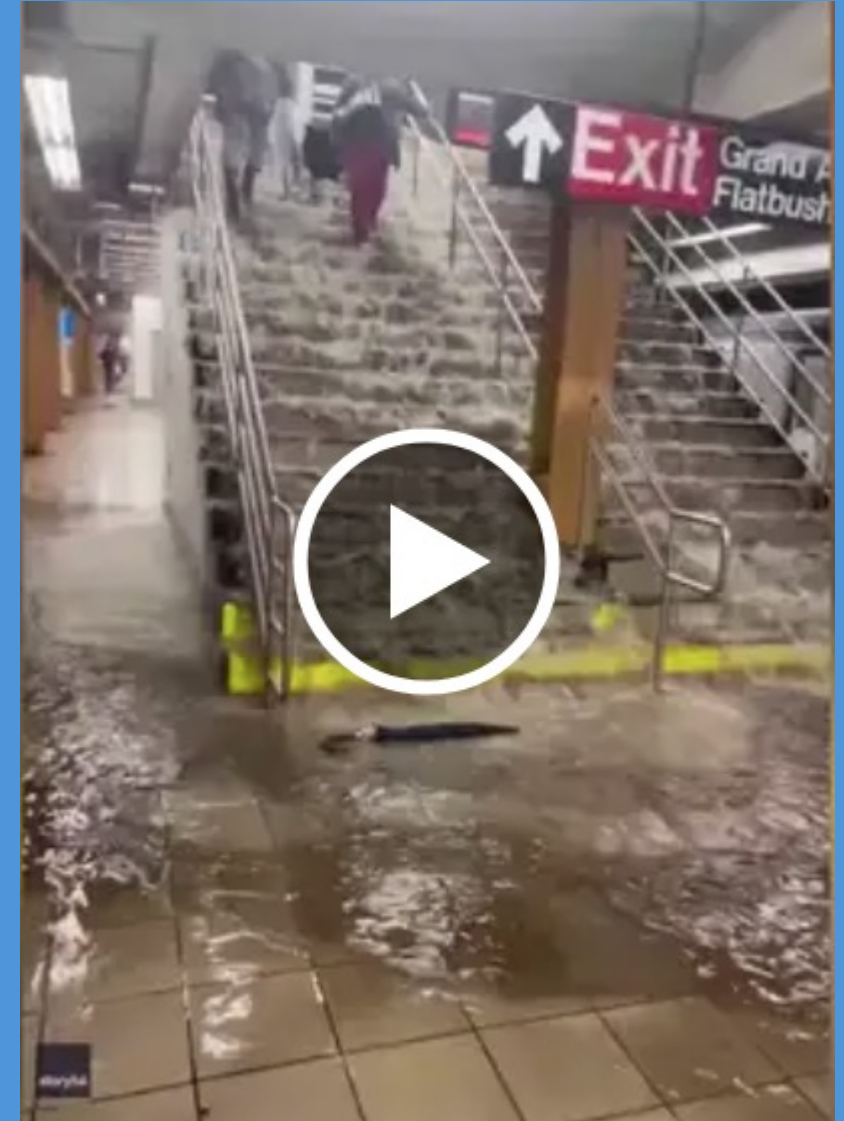


**Warm ocean waters = rapid storm intensification; more moisture leading to extreme rainfall; storms are staying stronger over land and pushing further inland before losing strength**

**RECORD TEMPERATURES = MORE ATMOSPHERIC MOISTURE  
= RECORD GLOBAL RAINS AND FLOODING**



**Remnants of Tropical Storm Ophelia hit New York on  
September 29, 2023  
With 4-9 " rain in 24 hours**





**Intense rain storms  
are the new normal**



# CONNECTICUT COASTAL FLOODING



**Coastal storms ( Sandy and Irene )**

**= \$\$\$ damage**

**Homes, roads, rail lines,  
infrastructure (sewerage treatment plants; storm drains)**

**Decline in real property values and tax base**

# **RIISING TEMPERATURES CAUSE DROUGHT AND FIRES**

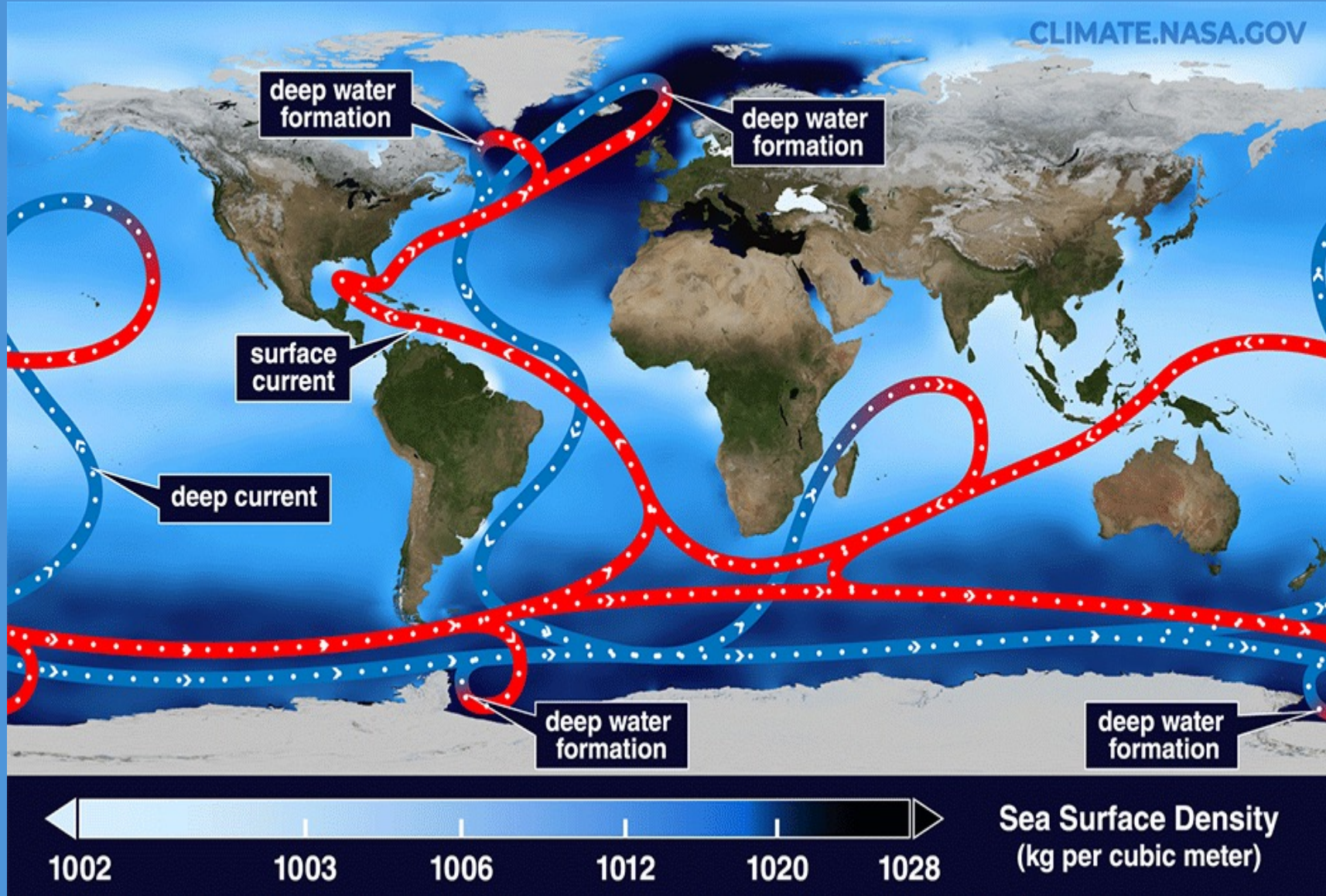


**California in the summer of 2022**



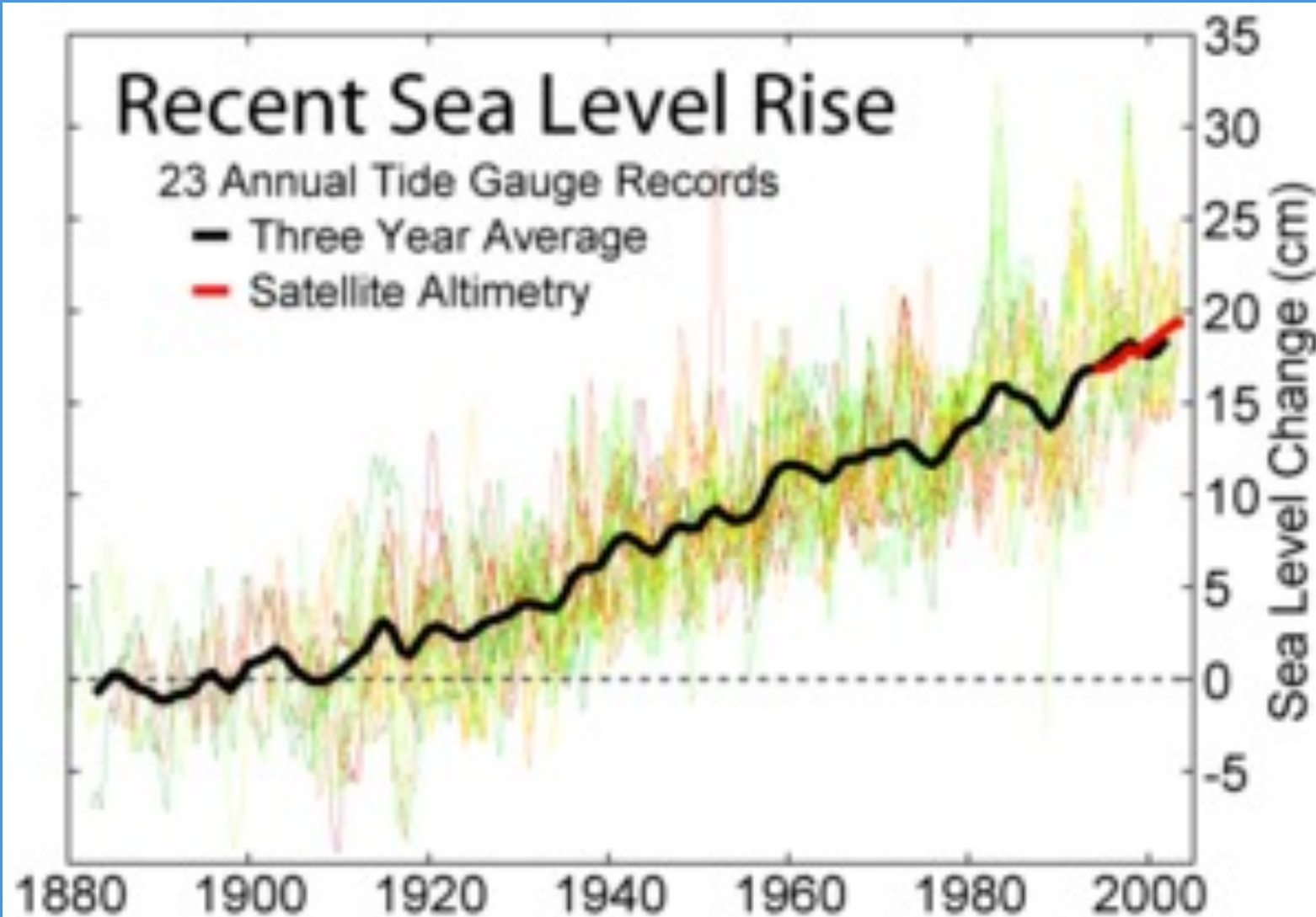
**Lake Mead August 2022**  
**Source: Bureau of Reclamation**

# GLOBAL WARMING LIKELY TO CHANGE OCEAN CURRENTS



**Europe will be a totally different place if the Gulf Stream shifts to the south**

**RISING TEMPERATURES =  
MELTING ICE + OCEAN THERMAL EXPANSION = SEA LEVEL RISE**



**Sea level has risen 10-11 inches in Connecticut since 1900, faster than global rate.**

Source: NOAA

**Mitigating sea level rise  
Will be a \$Trillion challenge  
For coastal cities!**

# *Ocean Acidification: The Other CO<sub>2</sub> Problem*

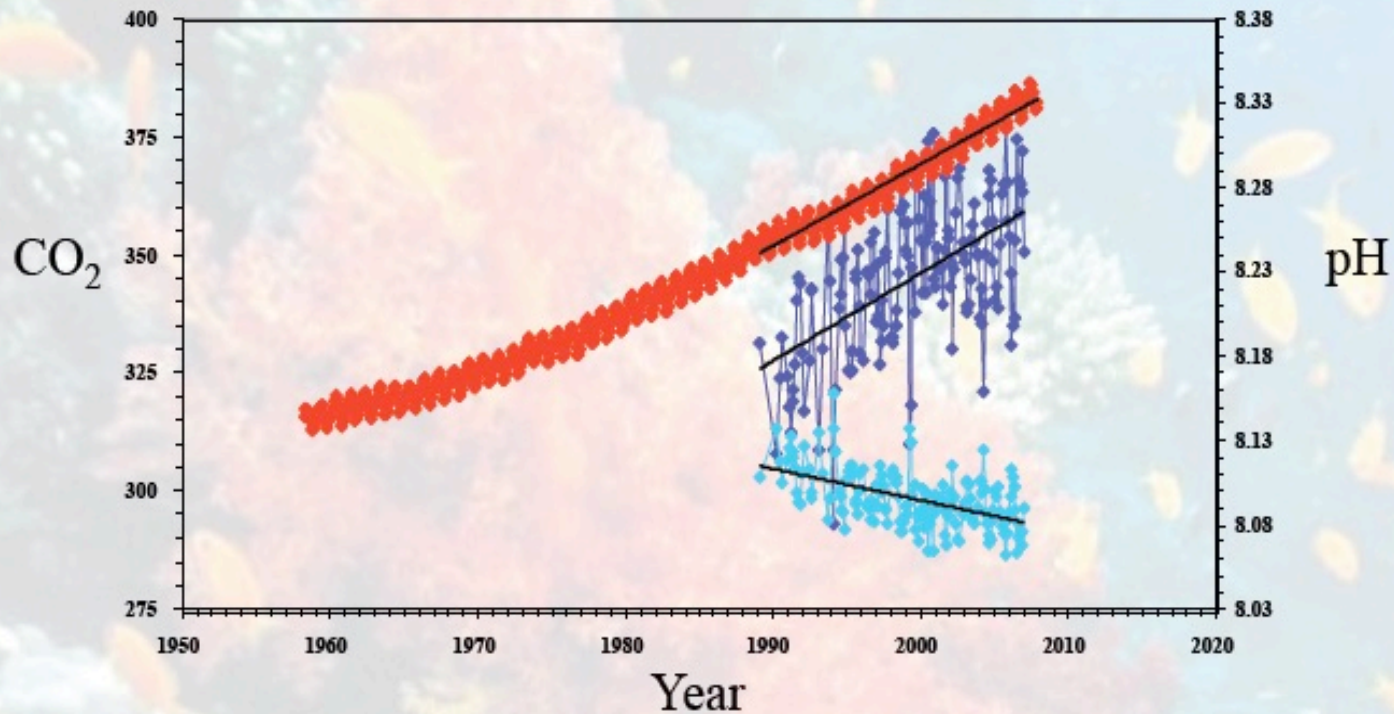
## *Council of Scientific Society Presidents*

### *2 May 2010*

Richard A. Feely

NOAA/Pacific Marine Environmental Laboratory

*With special thanks to: Chris Sabine, Simone Alin, and Sylvia Musielewicz*

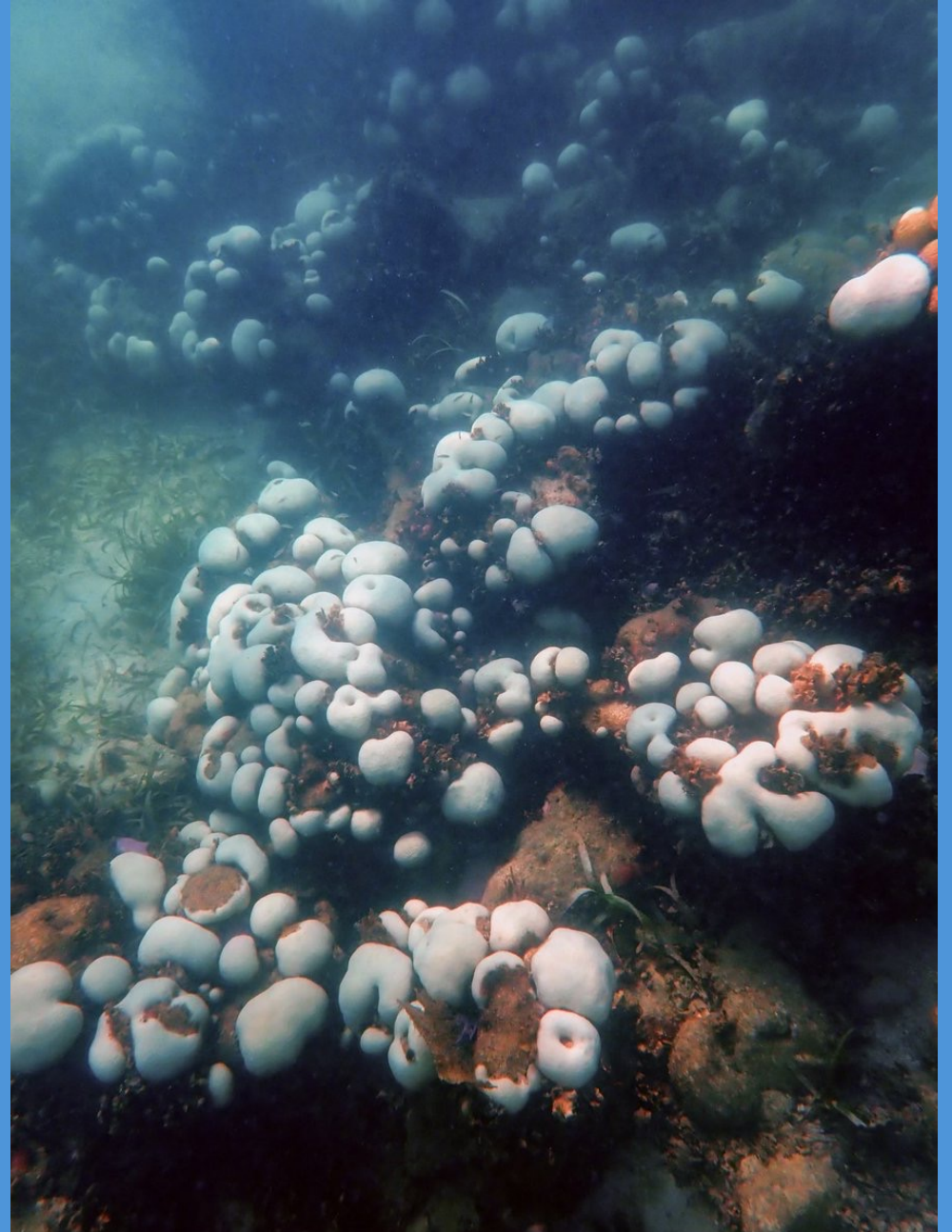






**Coral bleaching, weakening corals and potentially leading to death, occurs when water temperatures exceed the upper 80s Fahrenheit (low 30s Celsius).**

Source: NOAA July 2023



## SAY GOODBYE TO MAINE STEAMER CLAMS



**Fried whole clams with bellies – Yum!**



**THE INVASIVE GREEN CRAB  
IS THE VILLAIN**

## **ALASKAN KING CRAB HARVEST CLOSED IN 2022 AND 2023**



**Billions of Alaskan crabs have starved to death due to warming Ocean temperatures. Cod fish have moved north and are eating the young crabs**

Source: CNN 10/19/23

## **LARGE NUMBERS OF ALASKAN SALMON DYING BECAUSE THE WATER IS TOO HOT**



**On July 7, 2019 a major salmon stream on the west side of the Cook Inlet registered 81.7 °F.**

**Source: CNN 8/17/19**

## **THE AMAZON IS SUFFERING AS WELL**

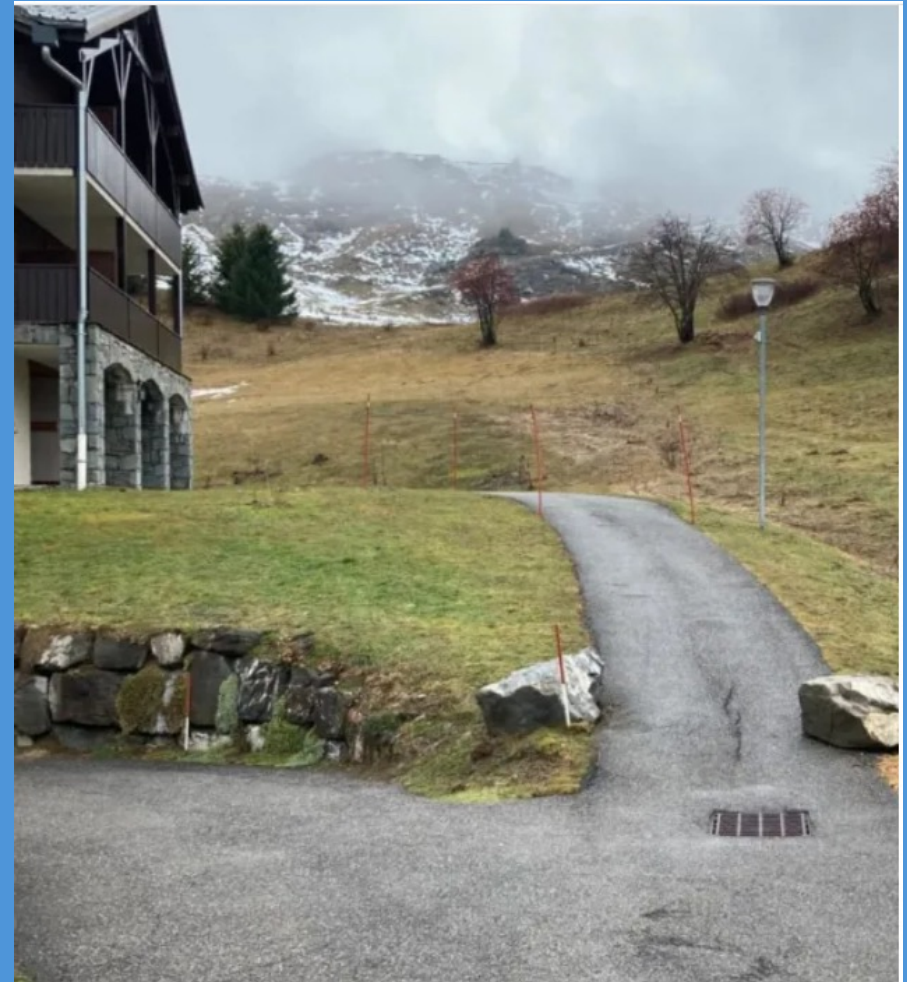


**Carcasses of 120 river dolphins found floating in Amazon tributary. Low water levels due to extreme drought and 100+ degree water temperatures that are intolerable to dolphins are likely cause of death. Thousands of fish are dying due to low oxygen levels**

# BYE BYE SKI RESORTS IN EUROPE !



**Klewenalp, Switzerland  
Jan. 4, 2023**

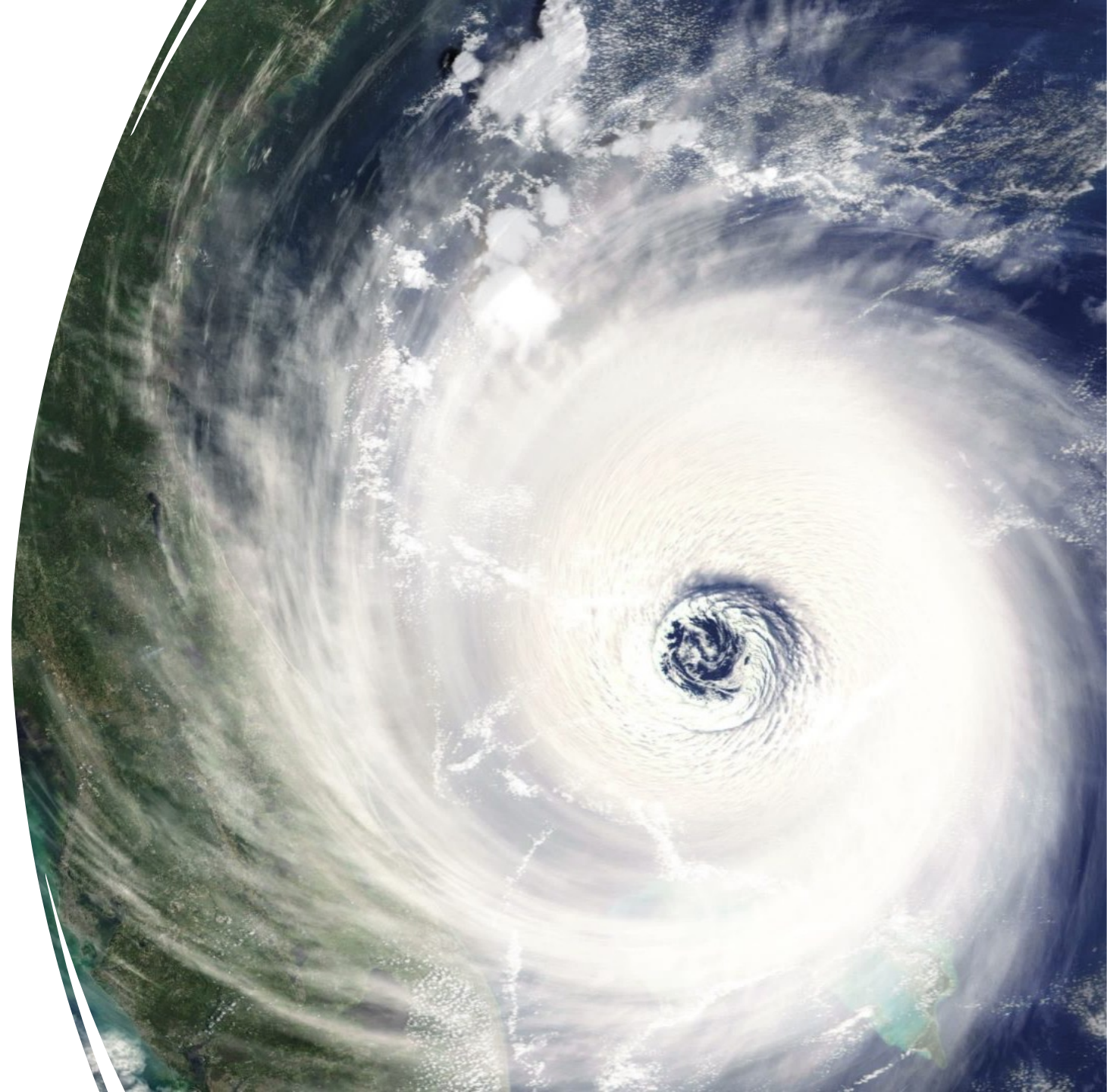


**Le Praz De Lys, France  
January 2023**

# CLIMATE DISRUPTION IS EXPENSIVE !

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- According to a published estimate by the insurance company Aon, total global damages from hurricanes, floods, tornadoes, fires and earthquakes in 2022 were **\$313 Billion**, of which \$132 B was insured.
- Moving coastal residential and business buildings and utility and transportation infrastructure inland ahead of sea level rise will be a multi-trillion dollar challenge.
- Residential, Infrastructure and crop insurance is getting prohibitively expensive.



# **ECOLOGICAL CHANGES IN THE USA DUE GLOBAL WARMING**

**(and these are not computer models!)**

- **Northward march of insect pests  
(Pine Bark beetle, Aedes Aegypti, Woolly Adelgid)**
- **Changes in crop distribution and growing season**
- **Premature bloom in late winter/spring destroying fruit crops**
- **Earlier bird migrations – (but often no food)**
- **Northern migration of traditional range of fish species, crabs and lobsters in the North Atlantic –  
Green crabs and loss of shrimp in Gulf of Maine**
- **Increase in allergy and asthma attacks**

***= Significant economic impact !***



## **Some Closing Thoughts**

- **Planet Earth is changing at an accelerating rate, propelled by mankind's thirst for energy from fossil fuels. The ecological impact will likely be devastating for humanity unless a "mid-course" correction is made now.**
- **The transition will take time – it is generational.**
- **Adapting to and mitigating the physical and ecological impacts of climate change will be the greatest economic, social, political and security challenge of the 21<sup>st</sup> Century!**

**THERE MUST BE NO FURTHER DELAY IN  
REDUCING OUR CARBON FOOTPRINT!**



# **WE CAN REDUCE CARBON EMISSIONS**

- **Transitioning from fossil fuel power generation to renewable energy**
- **Wind-solar-geothermal-tidal – and Nuclear**
- **Electric vehicles**
- **CO2 capture and sequestration from industrial plants**
- **Electric heat pumps**
- **Hydrogen fuels**
- **Better insulation in buildings**
- **Using lower emission technologies for cement and metal production**

# WHAT CAN WE DO TO MAKE A DIFFERENCE ?

## *Some Possible personal and state initiatives to Reduce Carbon Footprints & Promote Energy Conservation*

- **Upgrade home insulation (get an energy audit!).**
- **Use energy efficient electric appliances and LED lightbulbs.**
- **Operate fuel efficient vehicles.**
- **Increase fuel taxes – apply revenues to conservation initiatives.**
- **Expand low cost public transport.**
- **Support community conversion to natural gas.**
- **Support tax breaks for solar and wind energy.**
- **Promote residential, institutional and business re-cycling.**
- **Plant More Trees - community parks and roadsides.**
- **Reduce the area of your lawn**
- **Stop using disposable plastic bags and bottles**

***COLLECTIVELY, SMALL STEPS MAKE A BIG DIFFERENCE!***