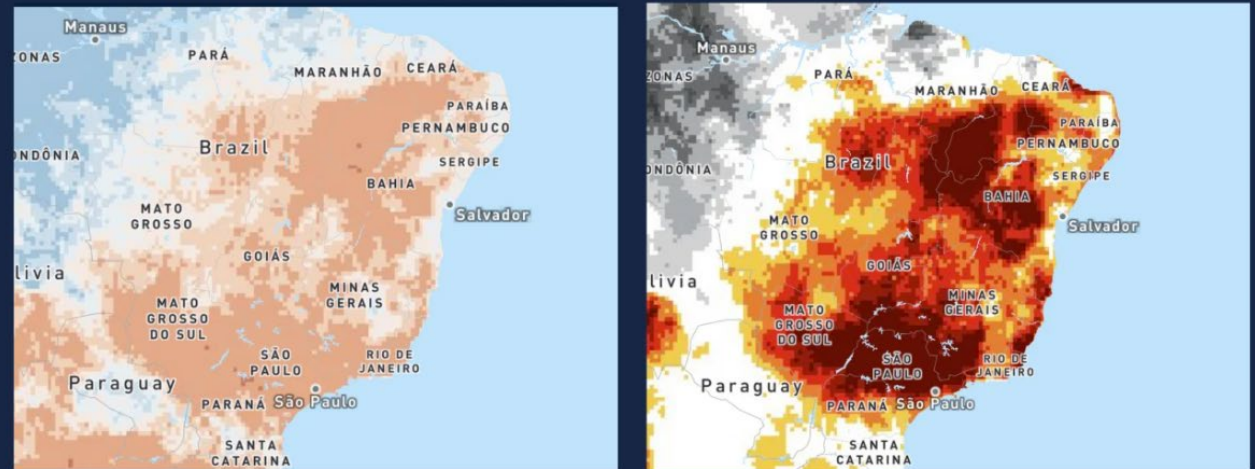


Fingerprints of Climate Change

Public Perception, Communication, and Shared Understanding

Average temperatures over February 14-20, 2025



Temperature departure (°C)

-14° -3° 0° +3° +14°

Climate Shift Index

-4 -2 0 2 4

Daily average temperature departure averaged over February 14-20, 2025.
Analysis based on ECMWF ERA5 and NOAA GFS. Temperature departures from 1991-2020 normal

CLIMATE CENTRAL

Shel Winkley

Meteorologist, CBM #780

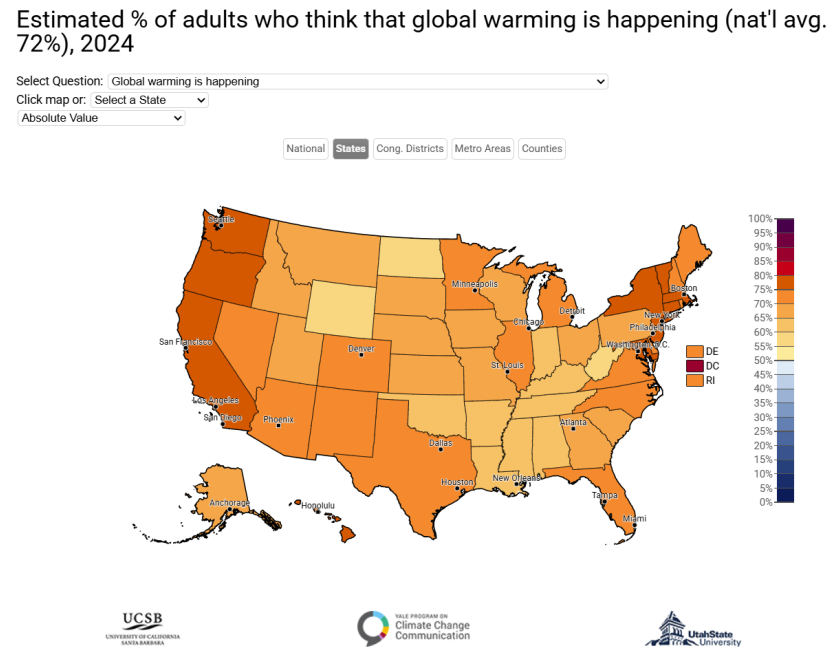
Weather & Climate Engagement Specialist

@shelwinkleywx

It's a much harder sell to tell people, we have too much of this thing that's going to hurt you, as opposed to, we have not enough of this thing, so take care of it.

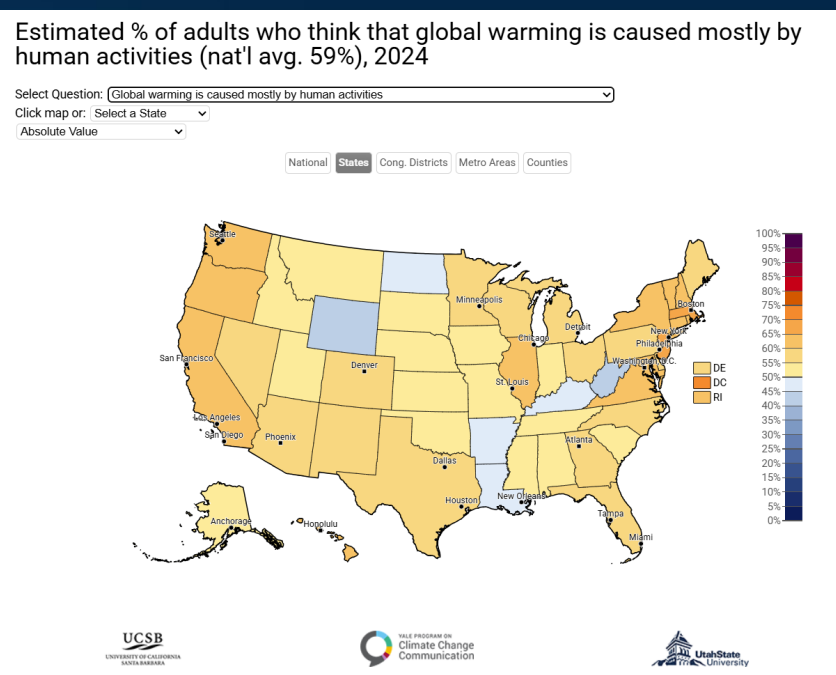
- Latif Nasser - Radiolab

Connecting the data to real life:

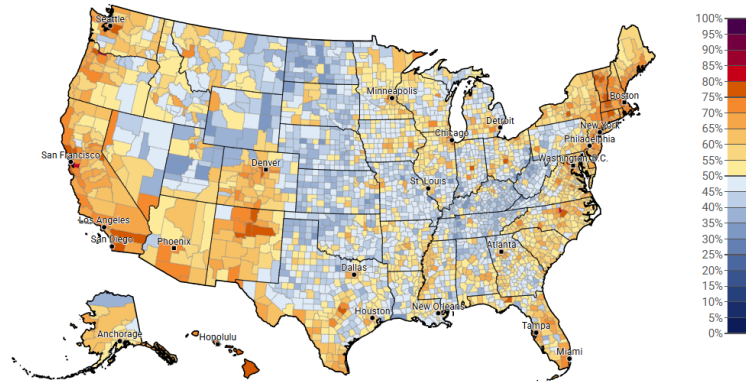


A majority of adults in the U.S. already know that **Climate Change is Real**

Most understand humans are the cause



% of Americans who think climate change is affecting...

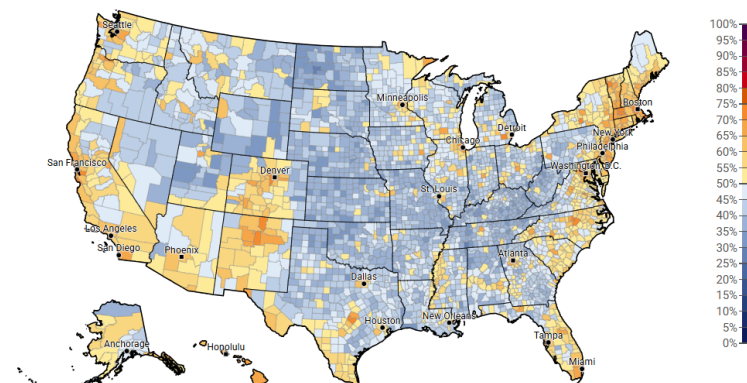


UCSB
UNIVERSITY OF CALIFORNIA
SANTA BARBARA

YALE PROGRAM ON
Climate Change
Communication

UtahState
University

Extreme Heat: 64%



UCSB
UNIVERSITY OF CALIFORNIA
SANTA BARBARA

YALE PROGRAM ON
Climate Change
Communication

UtahState
University

Hurricanes: 58%

****PRELIMINARY****

Attribution maps currently unpublished/in-prep by YPCCC

Other beliefs:

Flooding: 58%

Wildfires: 63%

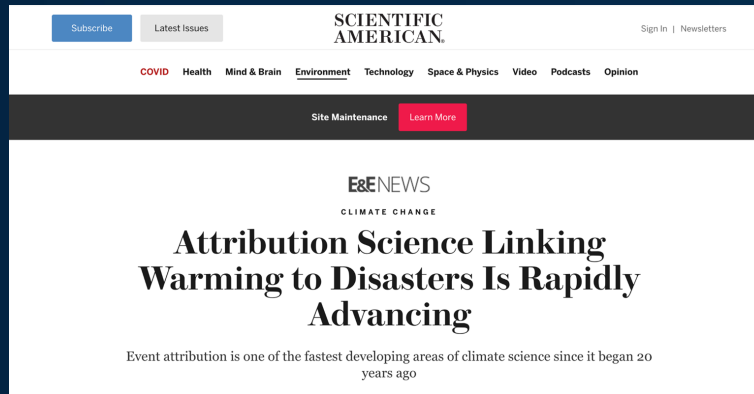
Drought: 61%

Sea Level Rise: 58%

Water Shortages: 55%

Extreme Event Attribution

- Helps connect the dots between extreme weather and climate change
- *Can* answer change in likelihood/frequency
- *Can* answer change in intensity/severity
- Done with speed & clarity
- For the public, “good & timely” holds immense value
- ...more value than “perfect but late”



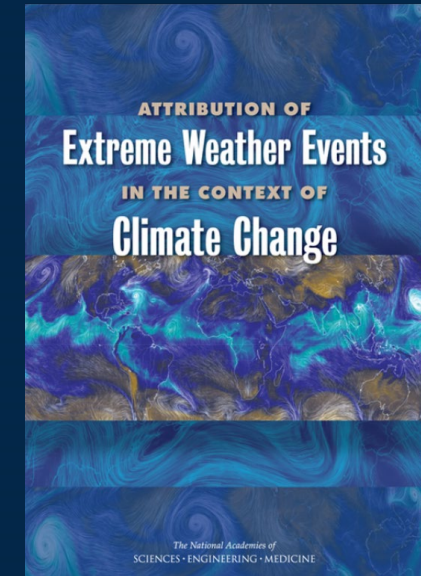
World Weather Attribution



Extreme rainfall, Storms

Autumn and winter storm rainfall in the UK and Ireland was made about 20% heavier by human-caused climate change

During the winter half-year of 2023/2024, western Europe experienced a series of damaging storms. These storms led to disruptions and the associated precipitation caused exacerbated flood risks.

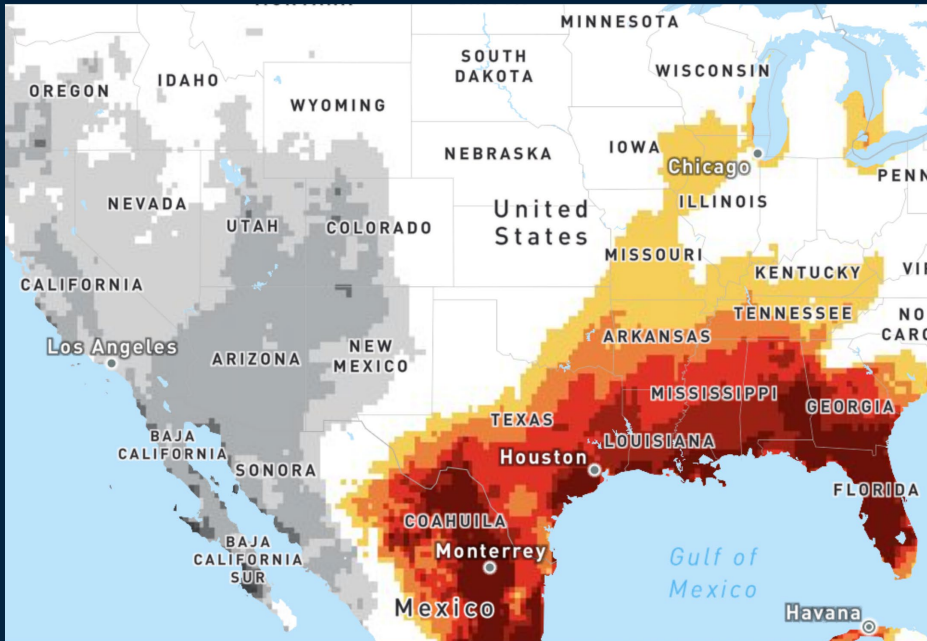


Extreme Event Attribution Tools

Climate Shift Index

Apr 2, 2025

Change in likelihood due to climate change



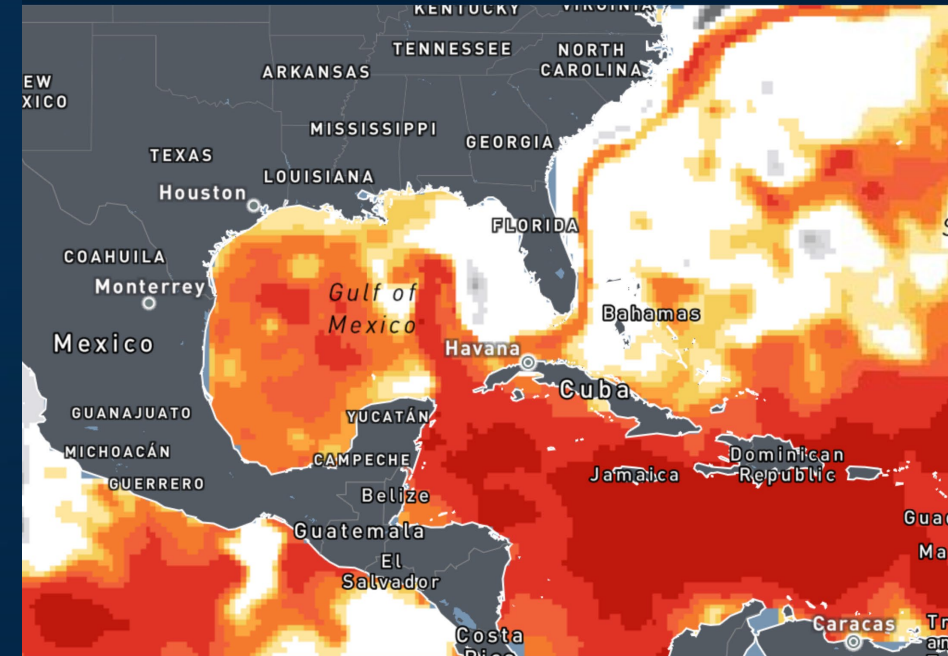
Climate Shift Index for average temperatures.
Based on NOAA GFS forecasts through 2025-03-29T18Z.

CLIMATE CENTRAL

Climate Shift Index: Ocean

Mar 28, 2025

Change in likelihood due to climate change



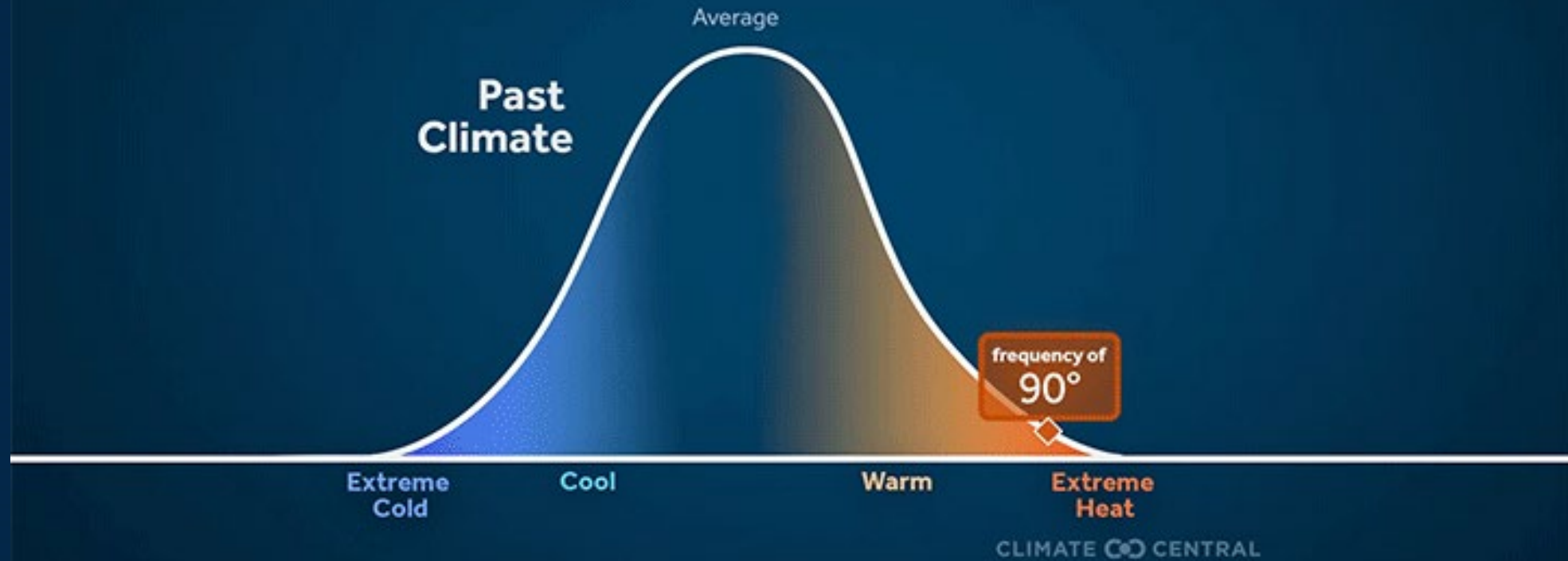
Climate Shift Index: Ocean for average sea surface temperatures.
Based on NOAA OISST. Dates are UTC.

CLIMATE CENTRAL

- Daily
- Global
- **Answers the “why” now, ahead, immediate after extreme events**

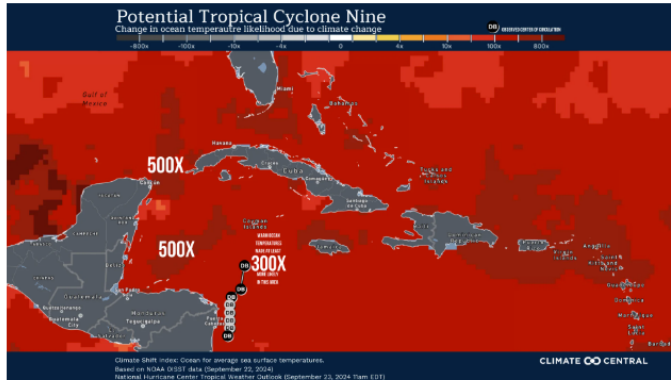
CLIMATE SHIFT INDEX (CSI)

How climate change impacts daily temperature



September 23, 2024

Today, the National Hurricane Center initiated forecasts for Potential Tropical Cyclone Nine, which is expected to strengthen into a hurricane as it moves into the Gulf of Mexico. Exceptionally warm sea surface temperatures along the system's projected path, through the Northern Caribbean and Eastern Gulf of Mexico, have been made at least **200 to 500 times more likely due to human-caused climate change**.



Note: This is NOT a storm forecast. Visit the [National Hurricane Center](#) for the latest updates and information on how the storm is evolving. For more information on the [Climate Shift Index: Ocean](#), refer to the FAQs.

What do experts say?

Dr. Daniel Gilford, Meteorologist and Climate Scientist at Climate Central, said: “Unseasonably hot ocean temperatures made hotter by human-caused climate change will offer the storm plenty of fuel to intensify once it becomes better organized.”

csi.climatecentral.org/ocean

“Covering these [unnatural] disasters feels like the same story every time. We write about disaster coming, the disaster happening, and then the aftermath...”

CLIMATE CENTRAL

What's this? See FAQ →

Climate Shift Index: Ocean

- Select map:
- Climate Shift Index: Ocean
 - Sea Surface Temperature Anomaly
 - Sea Surface Temperature

Date: Sep 25, 2024

Show tropical cyclones

Tropical Cyclones (2024 Atlantic Basin)

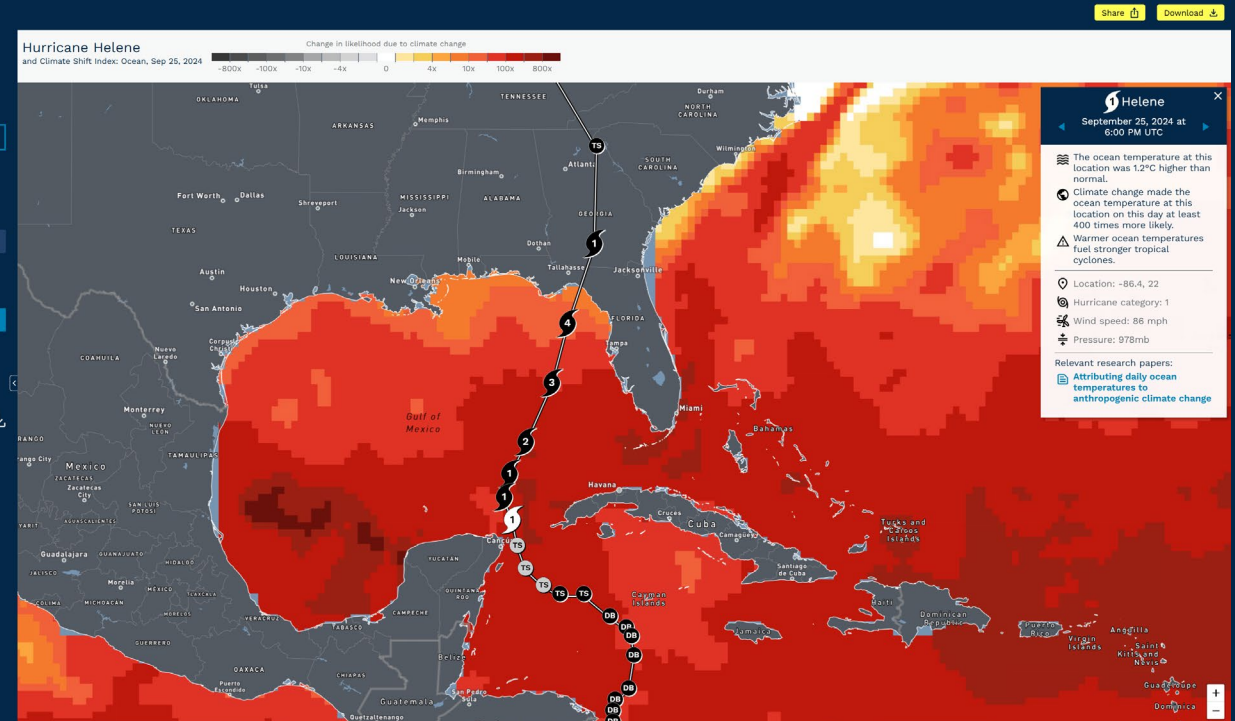
Helene (2024)

Highlight storm points associated with map date

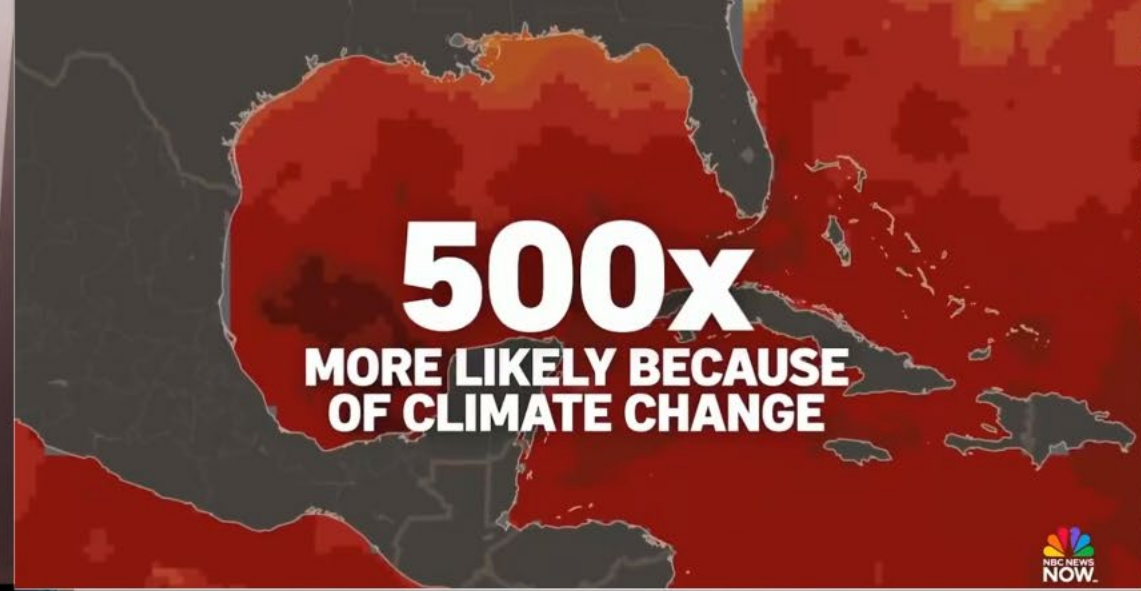
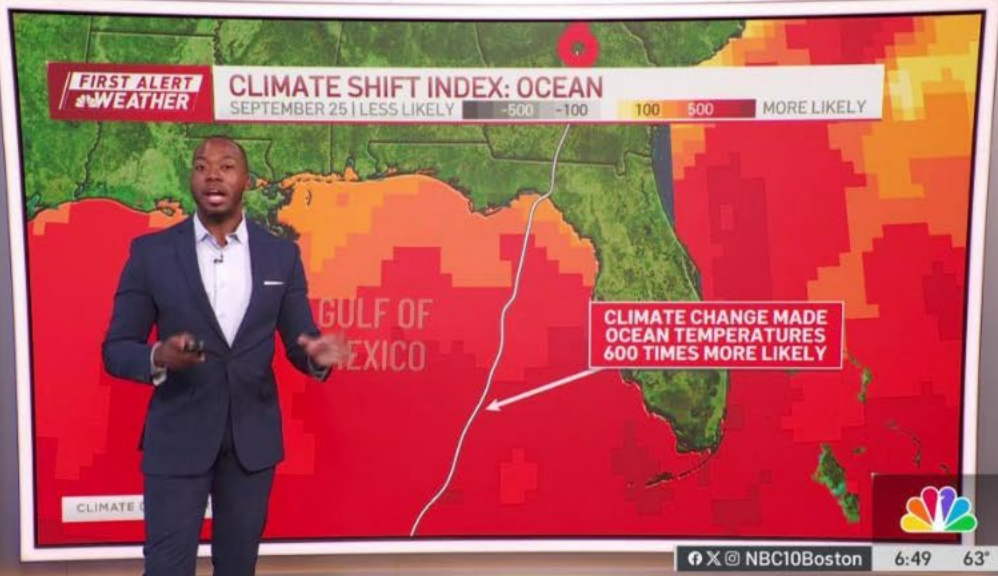
Advanced settings

Download this day's CSI: Ocean map in KML format

Tropical cyclone track data from National Hurricane Center. Icons indicate position of storm, not storm's size.
Climate Shift Index: Ocean for average sea surface temperatures. Based on NOAA OISST. Dates are UTC.



Hurricane Helene
CLIMATE CENTRAL

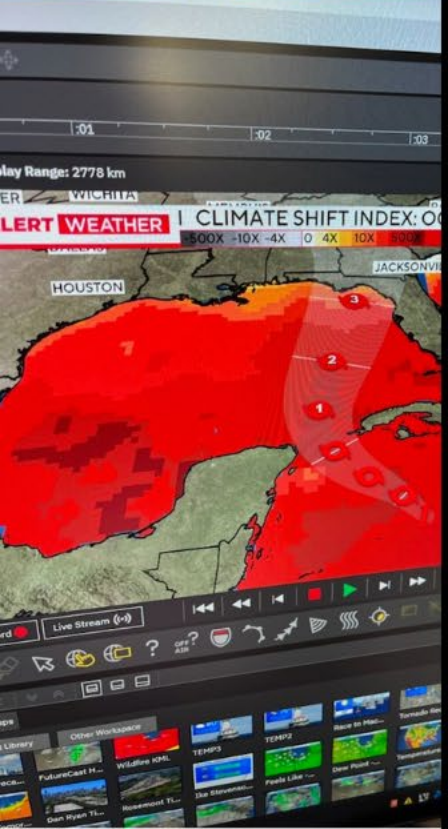


CLIMATE CENTRAL

Climate Shift Index: Ocean

500x
 MORE LIKELY

Tropical Storm Helene

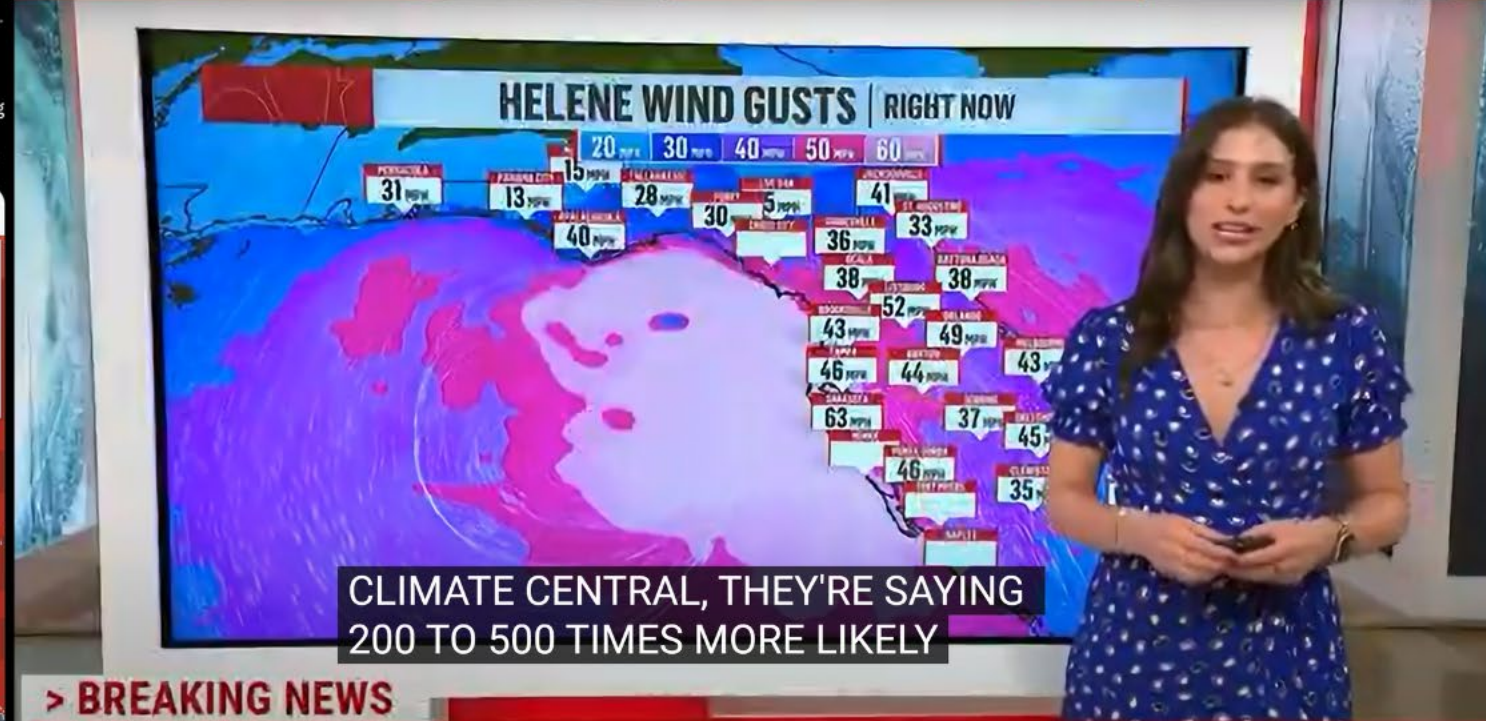


John Morales
 @JohnMoralesTV

#Helene passing over water >3°F hotter than normal, a condition made 600x more likely by climate change. Cat 1→RI→Cat 4 by landfall, tying the all-time record of 5 straight years with a U.S. landfalling major #hurricane. Expected storm surge 15-20 ft now. Wind damage far inland

Climate Shift Index: Ocean

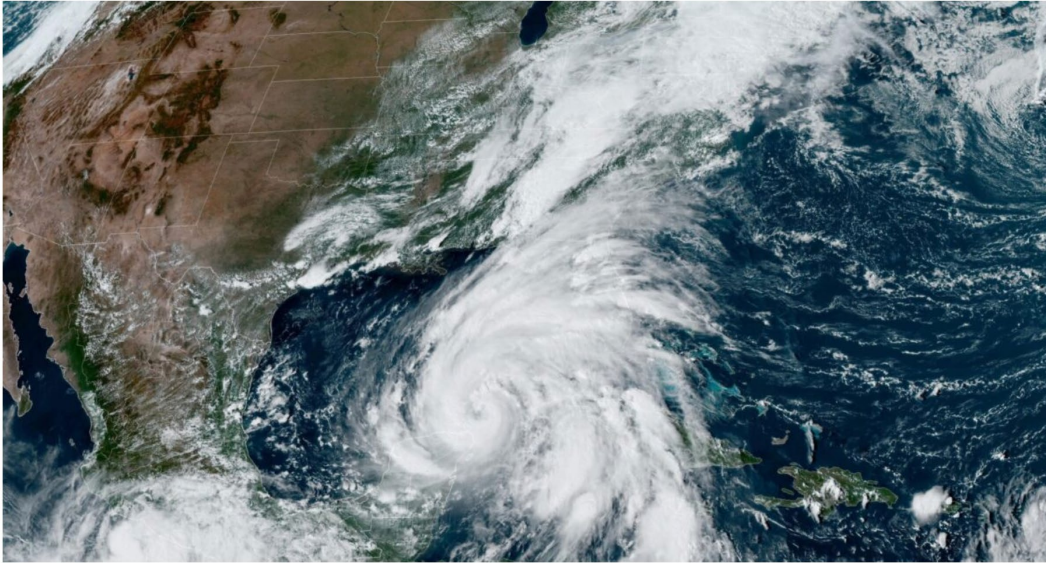
In this location on September 23, 2024
 Climate change made the ocean temperature at this location on this day at least 600 times more likely.
 The ocean temperature was 3.6°C.
 The temperature was 1.8°C hotter than normal for this date.
 (Latitude: 23.126, Longitude: -85.826)



> BREAKING NEWS

HURRICANE HELENE COULD CREATE AN "UNSURVIVABLE SCENARIO" STORM SURGE ON FL WEST COAST COULD REACH UP TO 20 FEET

THE REIDOUT



Hurricane Helene in the Gulf of Mexico on September 25. Image by NOAA's GOES-16 satellite.

Home > Storms > Climate change key driver of catastrophic impacts of Hurricane Helene that devastated both coastal and inland communities

Climate change key driver of catastrophic impacts of Hurricane Helene that devastated both coastal and inland communities

09 October, 2024

Extreme rainfall, Storms
North America

Late on September 26th, Hurricane Helene made landfall at category 4 on the Saffir-Simpson scale on the panhandle of Florida, bringing high winds, extreme rainfall and storm surges to coastal areas.

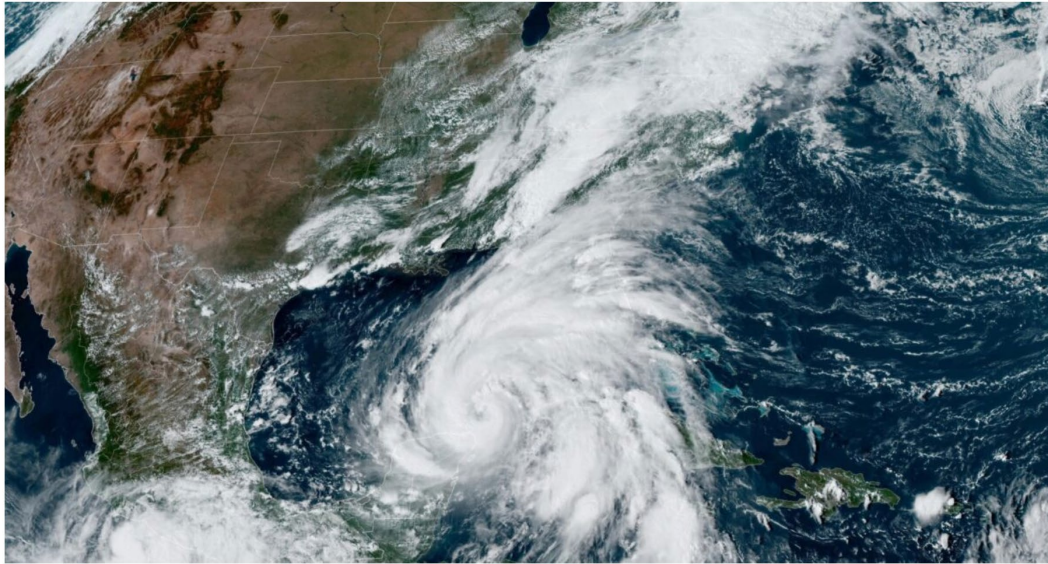
Full study

Download the full study: Climate change key driver of catastrophic impacts of Hurricane Helene that devastated both coastal and inland communities (53 pages, 10.2 MB)

Guide for journalists

Climate Change's Influence:

- Rainfall events as severe as those brought by hurricane Helene now occur about **once every 7 (3 – 25) years** in the **coastal region**, and about **once every 70 (20 – 3000) years** in the **inland region**.
- The rainfall was about 10% heavier due to climate change, and equivalently the rainfall totals over the 2-day and 3-day maxima were made about 40% and 70% more likely by climate change.
- If the world continues to burn fossil fuels, causing global warming to reach **2 °C** above pre-industrial levels, devastating rainfall events in both regions will become **another 15-25 % more likely**.



Hurricane Helene in the Gulf of Mexico on September 25. Image by NOAA's GOES-16 satellite.

Home > Storms > Climate change key driver of catastrophic impacts of Hurricane Helene that devastated both coastal and inland communities

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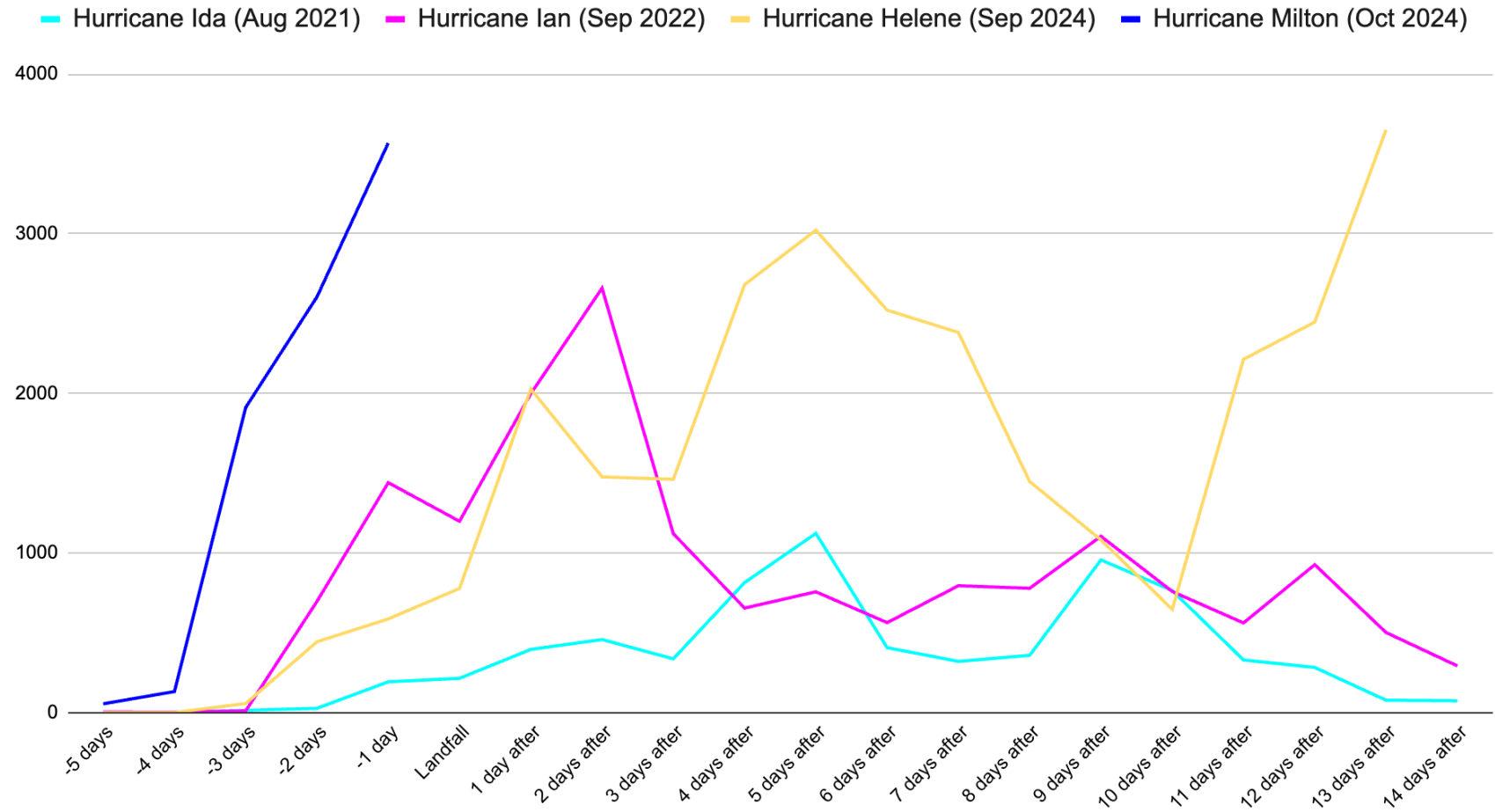
Guide for journalists

Climate Change's Influence:

- The number of such storms can now be expected **once every 53 years on average**, up from every 130 years), and equivalently that the maximum wind speeds of similar storms are now about ~14mph (around 11%) more intense.

- Together, these findings show that **climate change is enhancing conditions conducive to the most powerful hurricanes like Helene**, with more intense rainfall totals and wind speeds.

Articles mentioning hurricanes and climate change before and after landfall





Opinion
Hurricane Milton

The Guardian view on Hurricane Milton and other disasters: extreme politics is worsening extreme weather
Editorial

Thu 10 Oct 2024 13:36 EDT

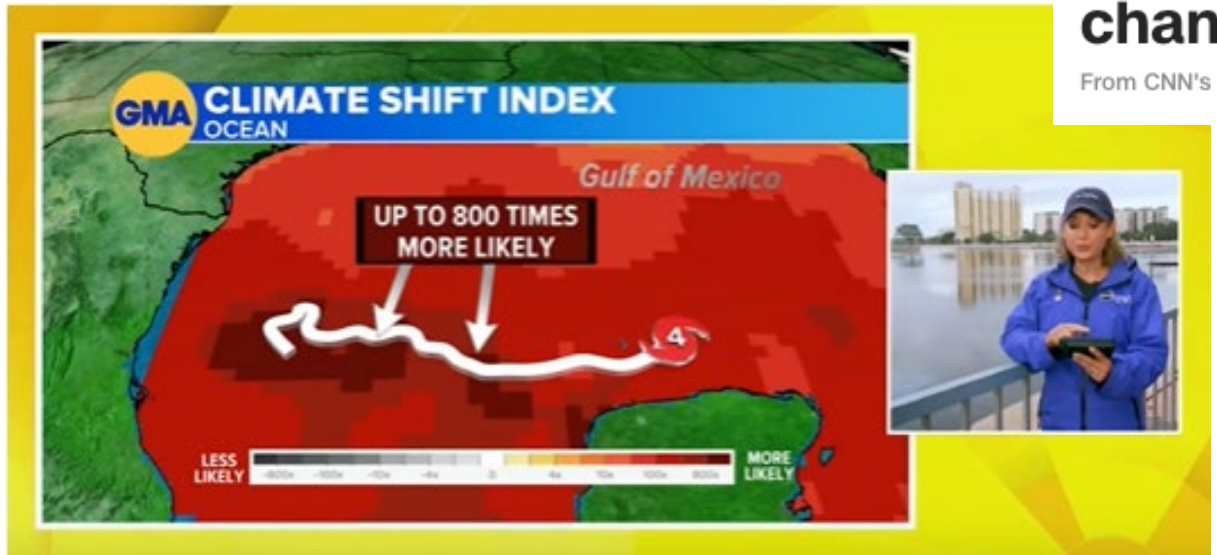
Share

Climate change deniers such as Florida's Ron DeSantis lament the impact of such events but won't acknowledge the underlying problem

4:10 p.m. EDT, October 7, 2024

Milton's strengthening fueled by warm water made hundreds of times more likely by climate change, analysis shows

From CNN's Rachel Ramirez



WEATHER

Milton joins Helene as a rapidly growing hurricane. Scientists point to climate change

azcentral.

Hayleigh Evans
Arizona Republic

Published 6:03 a.m. MT Oct. 8, 2024 | Updated 6:04 a.m. MT Oct. 8, 2024

HURRICANES

Hurricane Milton's rapid intensification linked to climate change, scientists say



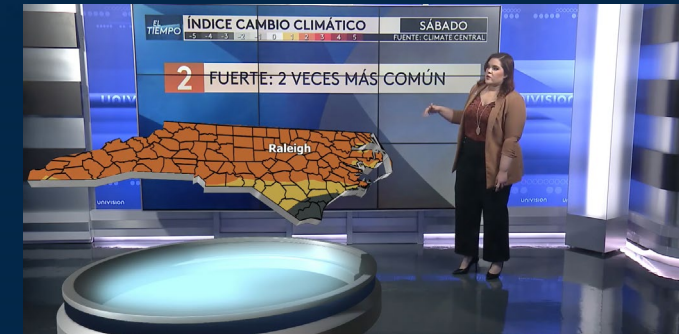
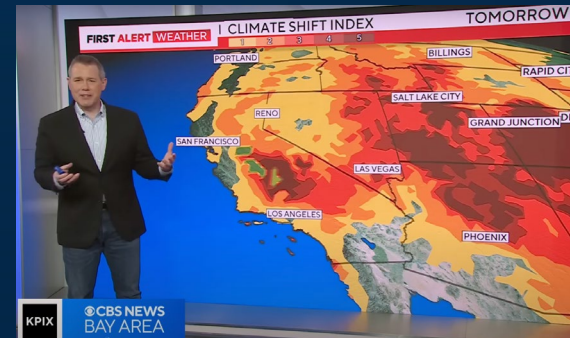
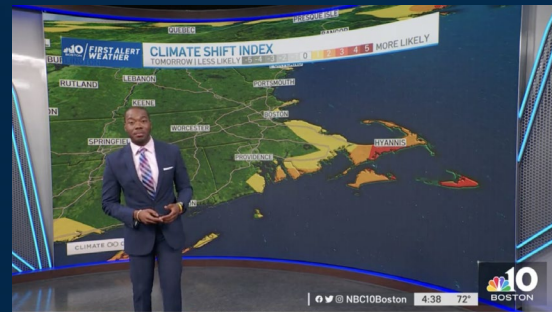
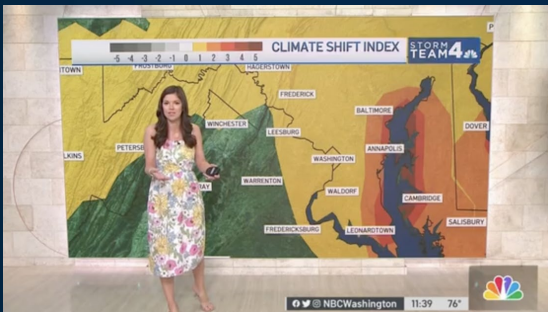
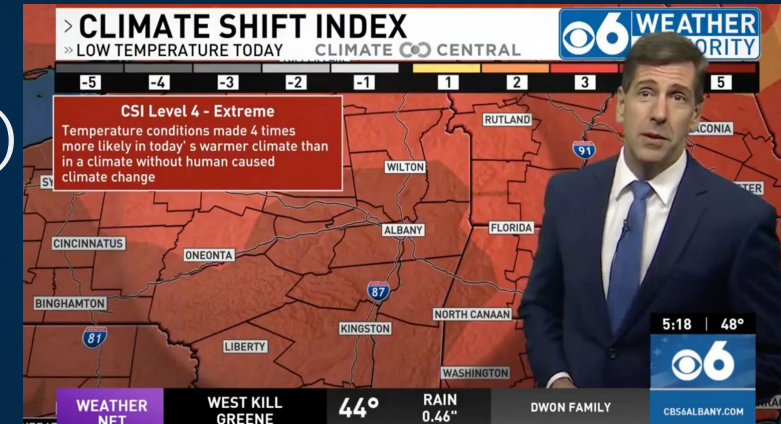
The storm's rapid intensification highlights how climate change is driving stronger, faster-developing hurricanes, fueled by rising sea surface temperatures.

KML for CSI

Integrate the data into your GIS system →



- Ability to localize the view to your specific area
- Greater customization (outlet branding for media)
- Greatly reduces daily prep/installation time
- More dynamic and aesthetically fluid



climatecentral.org/csi-kml

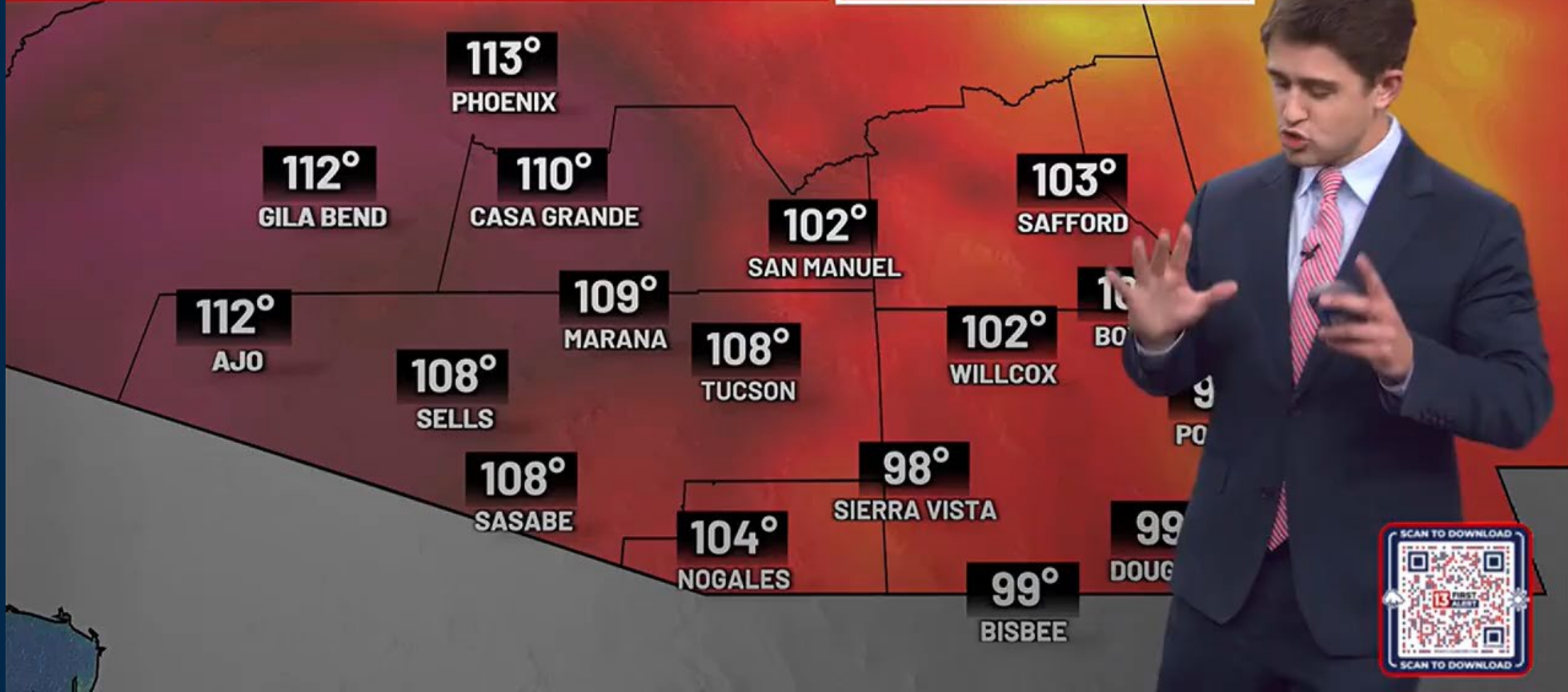
CLIMATE  CENTRAL

13 FIRST ALERT WEATHER

HIGH TEMPS

September 27th
- Tucson Average: 92°
- Phoenix Average: 97°

TODAY

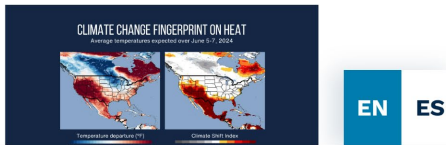


Cory Kowitz | Tucson, AZ

Climate change influencing early-season extreme heat across North America

Between June 5-7, much of the Western United States, Mexico, and Eastern Canada are poised to experience a period of unusually hot conditions made much more likely because of human-caused climate change. During this period, over 229 million people across North America will experience extreme heat made at least three times more likely because of human-caused climate change.

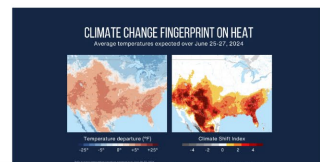
Note: This event is an extension of ongoing heat in Mexico and around the Gulf of Mexico, and it may continue beyond June 7 in some locations. Use the [Global Climate Shift Index map](#) to stay updated on heat in your region.



Southern U.S. impacted by climate change-influenced heat

Cities across the southern U.S. continue to grapple with extreme heat as temperatures reach severe highs made at least five times more likely because of climate change.

- Daily average temperatures are expected to reach [Climate Shift Index \(CSI\)](#) levels of 5 in cities across Texas, Alabama, Florida, Georgia, and North Carolina. Atlanta is expected to reach level 5 on both Tuesday, June 25, and Wednesday, June 26. **A CSI level 5 indicates** that human-caused climate change made this excessive heat at least 5 times more likely, signifying an exceptional climate change event.

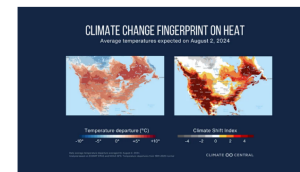


Nearly half of the U.S. will experience heat influenced by climate change on August 2nd

Nearly half of Americans are expected to experience heat made at least three times more likely because of climate change on Friday, August 2, 2024. This climate change-fueled heat will affect much of the U.S. and extend into Canada and Mexico, from July 31 through August 8, 2024.

Climate Shift Index exposure approaches record

Based on current temperature forecasts, a record-breaking **148 million Americans** are expected to experience CSI values of 3 or higher on August 2nd. That means their local temperatures would be made at least 3 times more likely because of climate change.

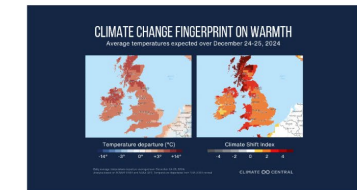


How unusual is the forecasted heat?

Holiday warmth across the U.K.

This year, Christmas is expected to be exceptionally mild in the United Kingdom and Ireland. Climate Central analysis shows that the unusually warm late-December temperatures forecast for the holiday (December 24-25) are at least twice as likely to occur due to human-caused climate change.

Note: Use the [Climate Shift Index map](#) to stay updated on heat in your region.



How unusual is this forecasted holiday warmth?

- During these two days, daily high temperatures across the **UK and Ireland** are forecast to range

The human fingerprint on extreme weather

Attribution Science

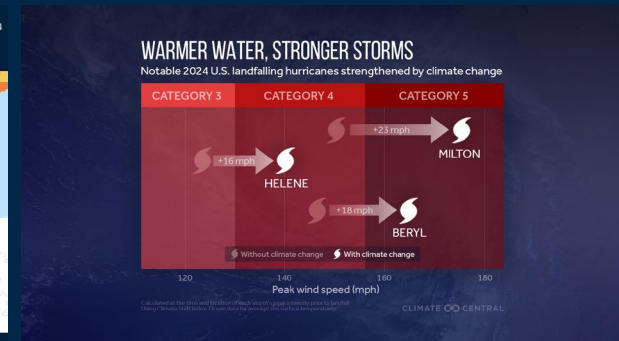
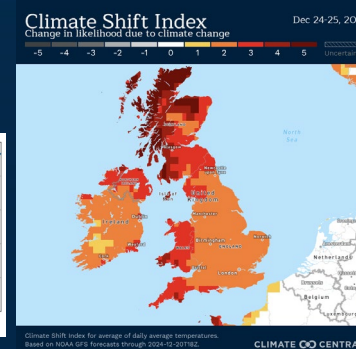
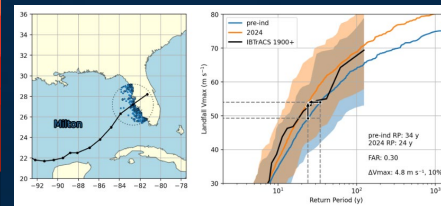
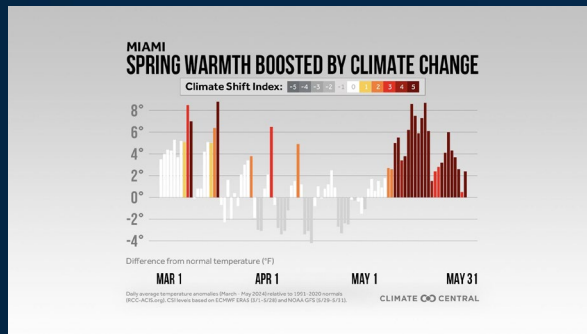
Makes the abstract of climate change more tangible

Personalizes Climate Change: Connects a global issue to local impacts

Increases Understanding: Connects the causation to people's lives

Motivates Action: Provides information for informed decision making & risk understanding

Builds confidence: for weather communicator's climate reporting especially where the climate connection wouldn't have been made without it



csi.climatecentral.org

csi.climatecentral.org/ocean

www.worldweatherattribution.org/

CLIMATE CENTRAL

Appreciate y'all.

swinkley@climatecentral.org

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- CSI-KML Access: climatecentral.org/csi-kml
- Realtime Climate Alerts:
climatecentral.org/realtime-climate
- Climate Matters:
climatecentral.org/climate-matters

