

STATE OF THE CLIMATE IN 2017

Environmental Dispute Resolution and Small States
6-7 SEPTEMBER 2018, LONDON, United Kingdom

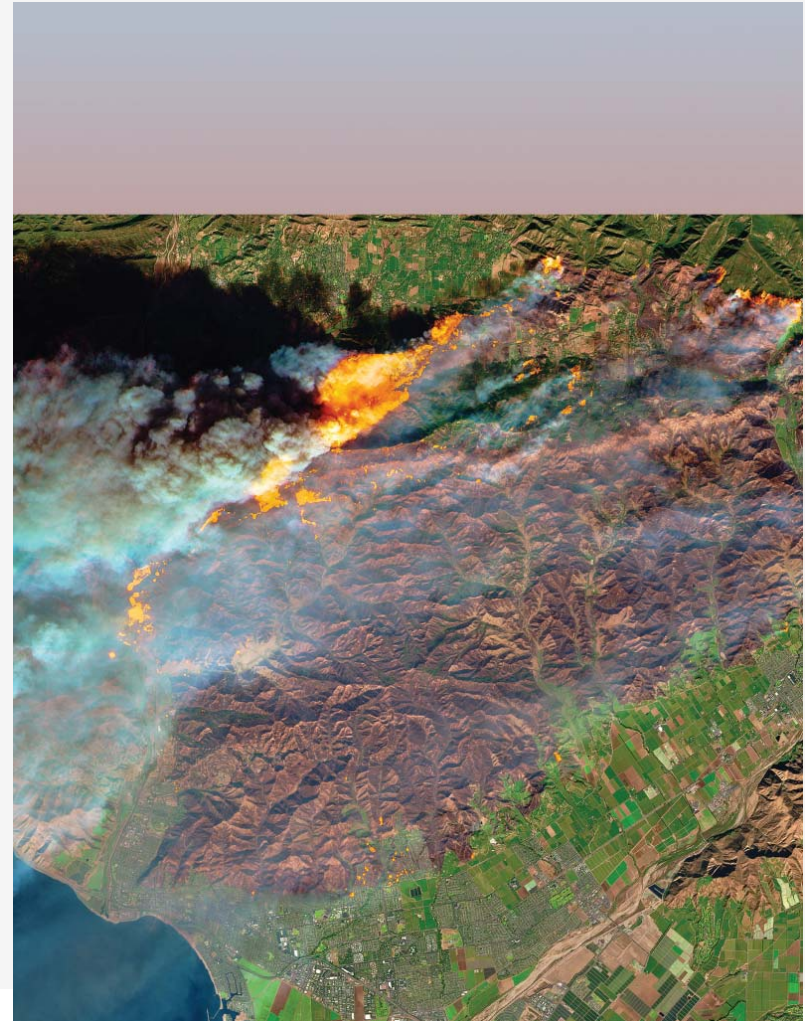
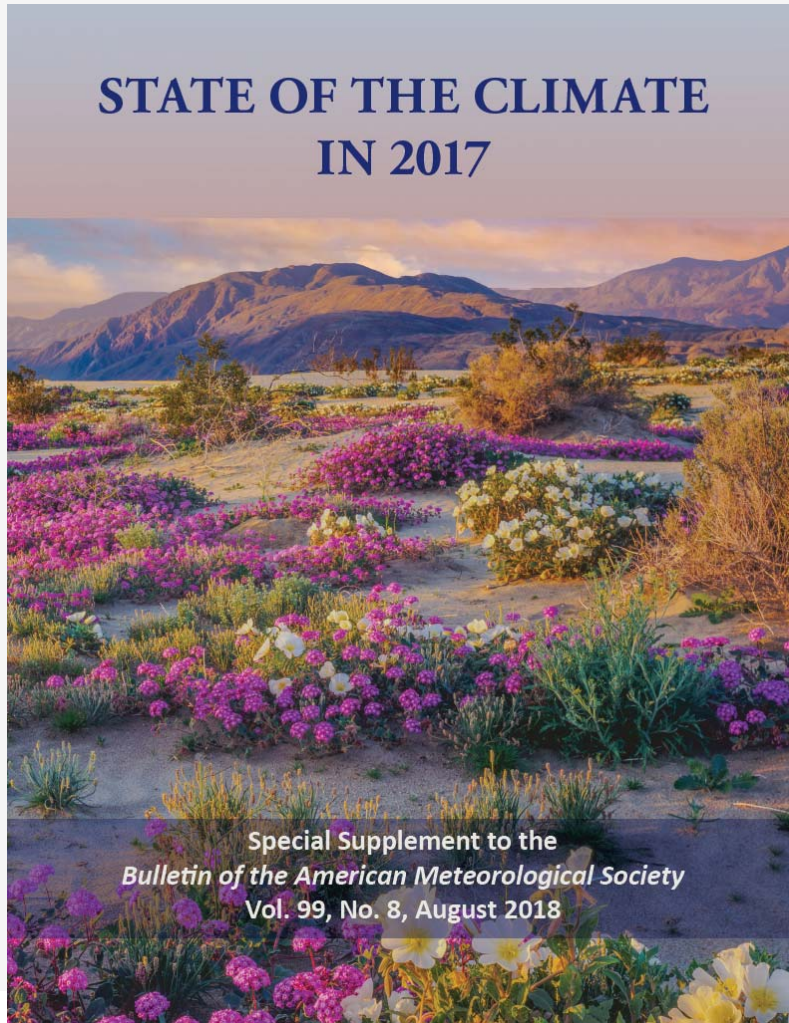
Peneshuro Lefale*, Dr Howard Diamond**

*LeA International www.ilea.co.nz

**NOAA Climate Science Program

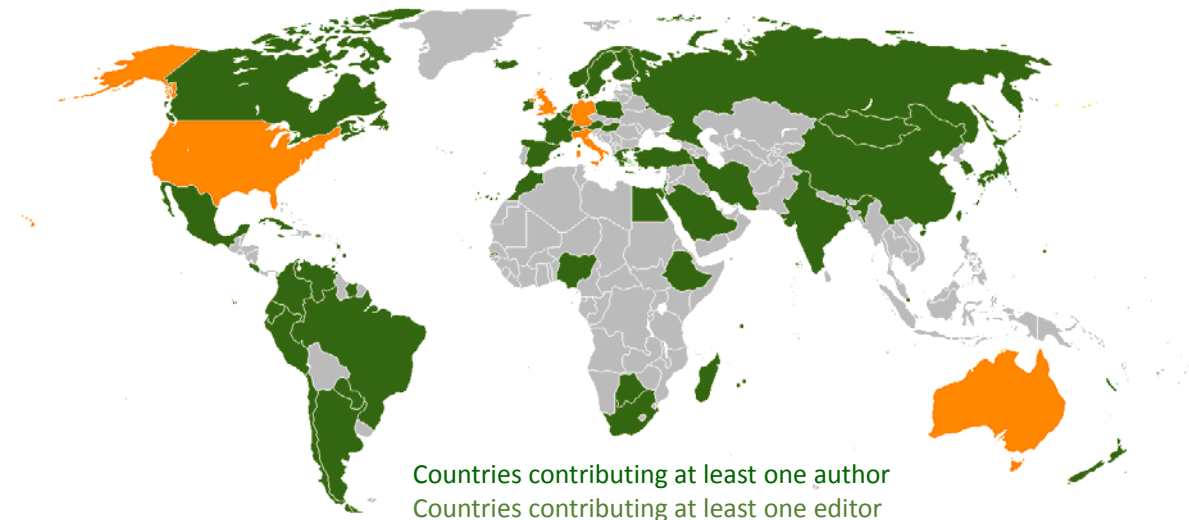
howard.diamond@noaa.gov

Highlights



Report is in its 28th Year of Publication

- Many scientists from many disciplines from around the world fit the pieces of Earth's climate system and its changes together to connect the dots
 - Dozens of essential climate indicators, extreme weather and climate events, historical context
- This report does not pursue **“attribution”** or contain **forecasts, scenarios, or projections**



524 authors from 65 countries; 19 editors on 3 continents



The Climate System



Atmosphere



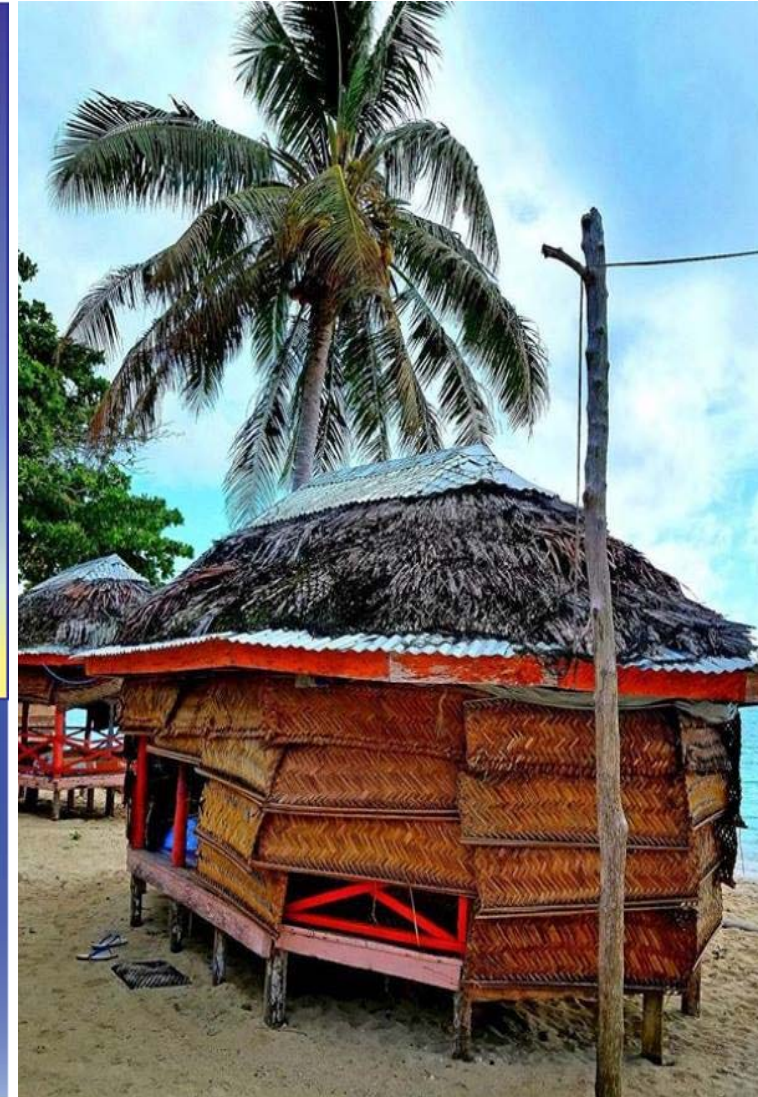
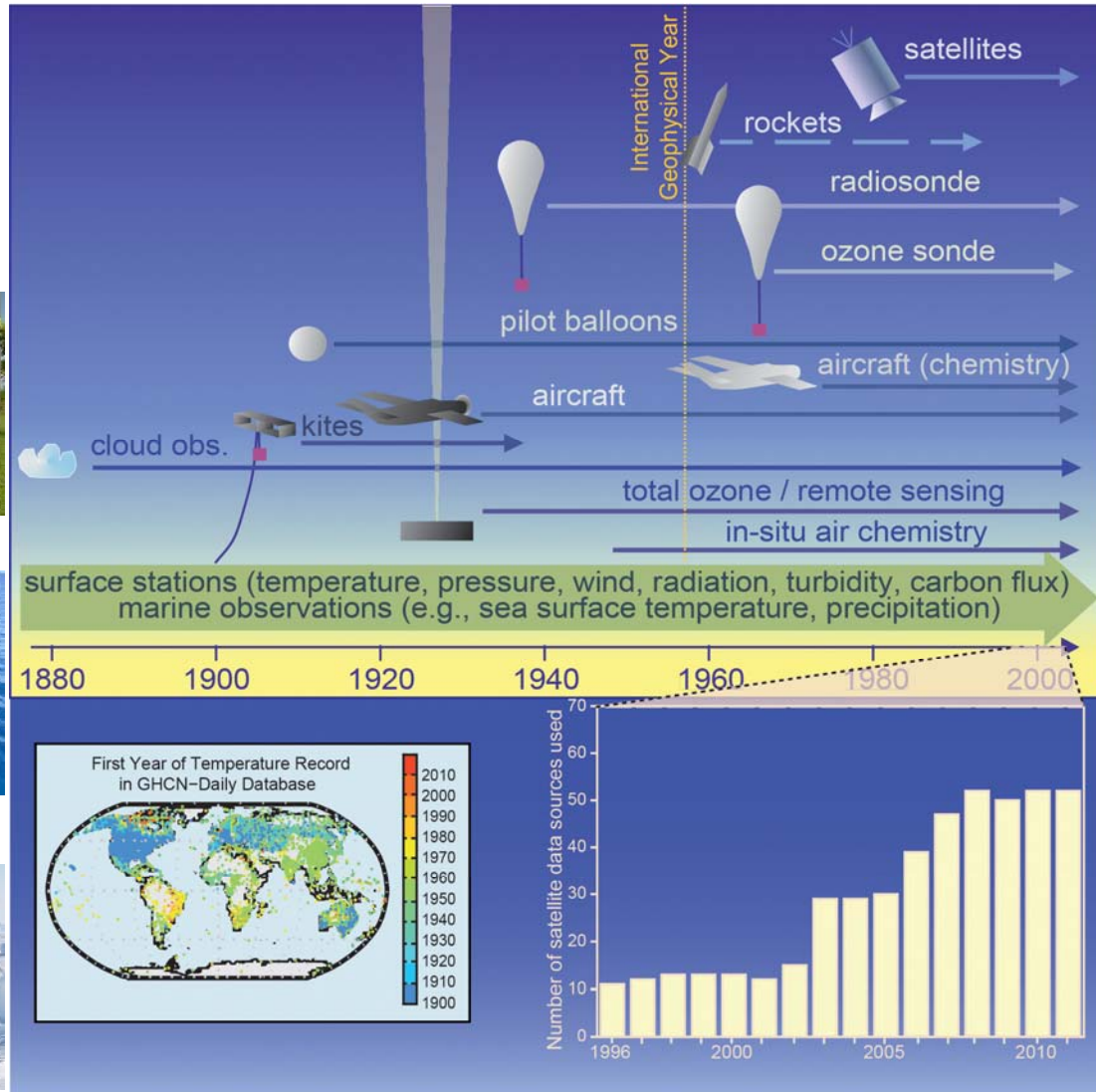
Land



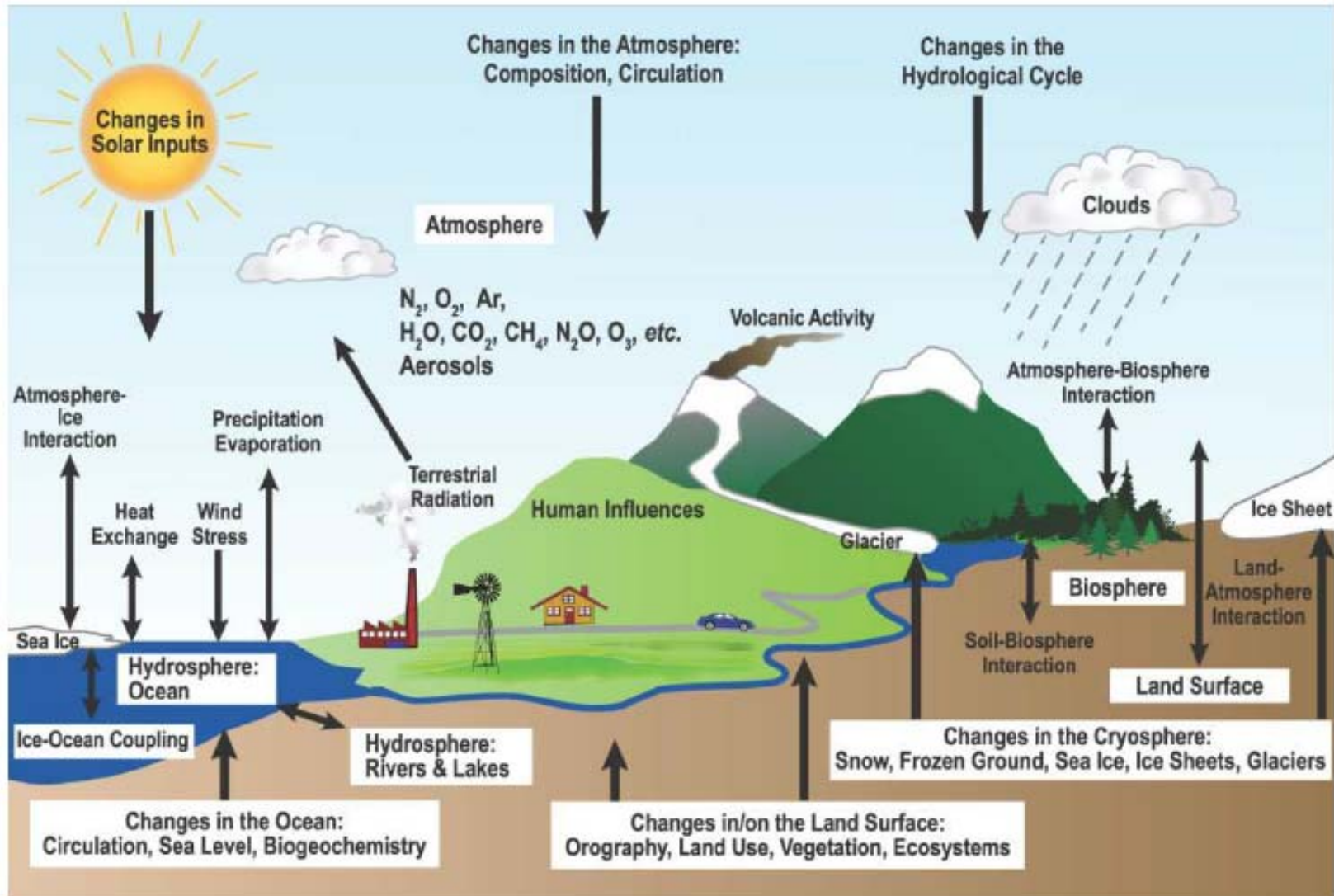
Oceans



Snow and Ice

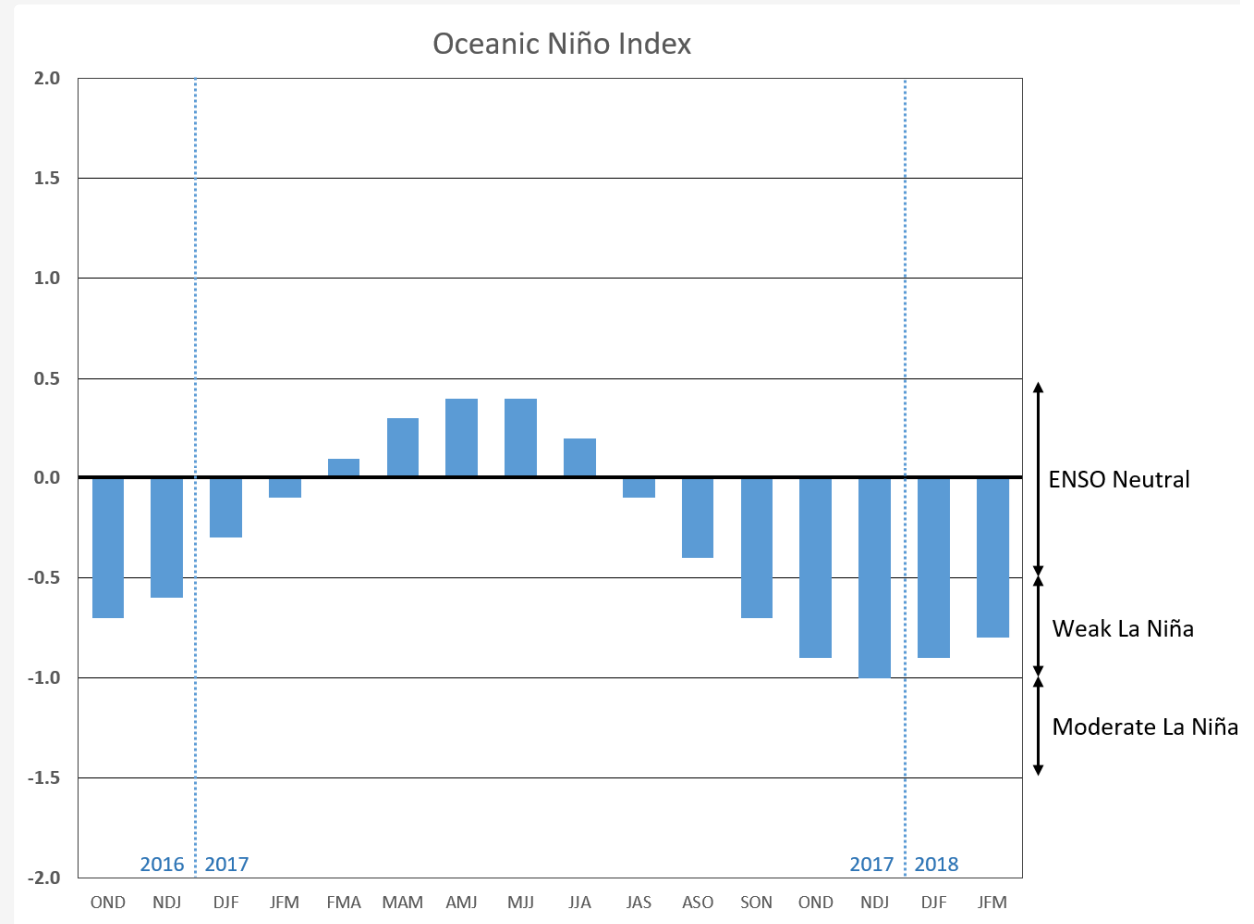


The Climate System



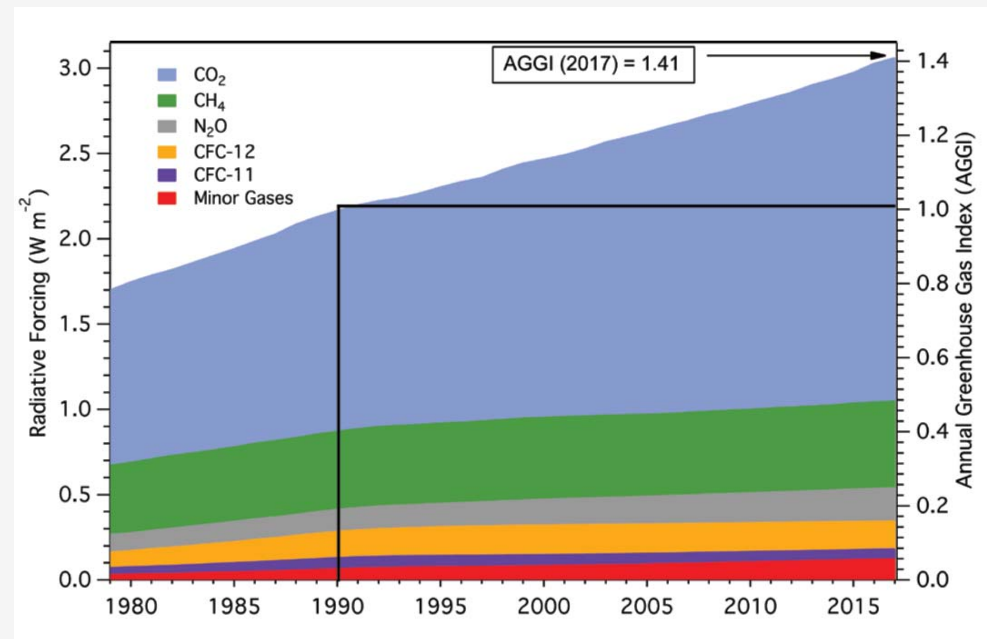
La Niña

- The state of ENSO provides important context throughout the report at several scales
- The warmest non-El Niño year in the instrumental record
- 2017 ended in weak La Niña conditions



Greenhouse Gases in 2017

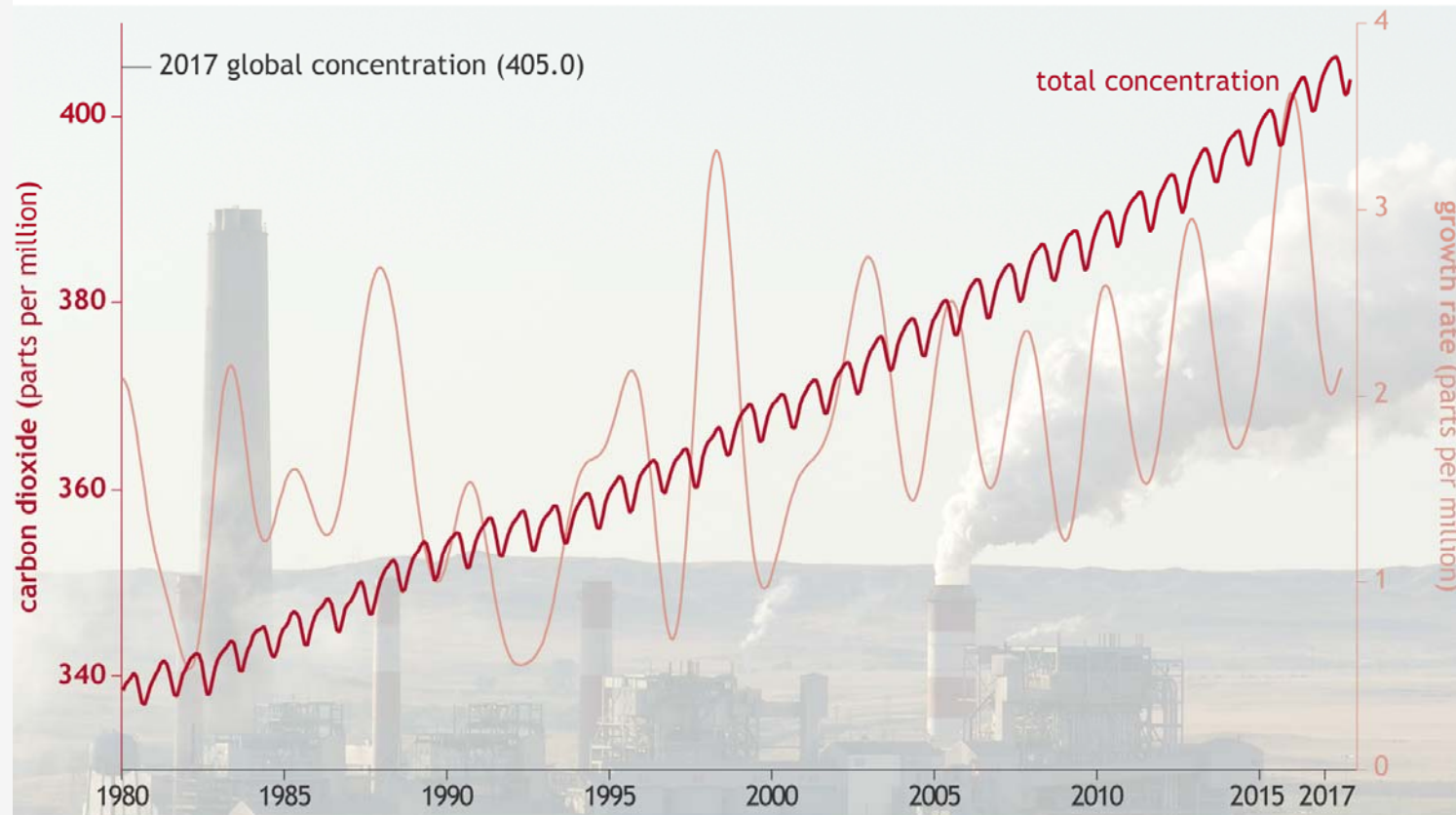
- Global averages of long-lived greenhouse gases (GHGs) in 2017
 - **Carbon dioxide (CO₂):** 405.0 ppm, an increase of 2.2 ppm from 2016
 - **Methane (CH₄):** 1849.7 ppb, a 6.9 ppb increase since 2016
 - **Nitrous oxide (N₂O):** 329.8 ppb, a 0.9 ppb increase since 2016
- Total GHG “forcing” has increased 41% since 1990



<https://www.bloomberg.com/graphics/2015-whats-warming-the-world/>

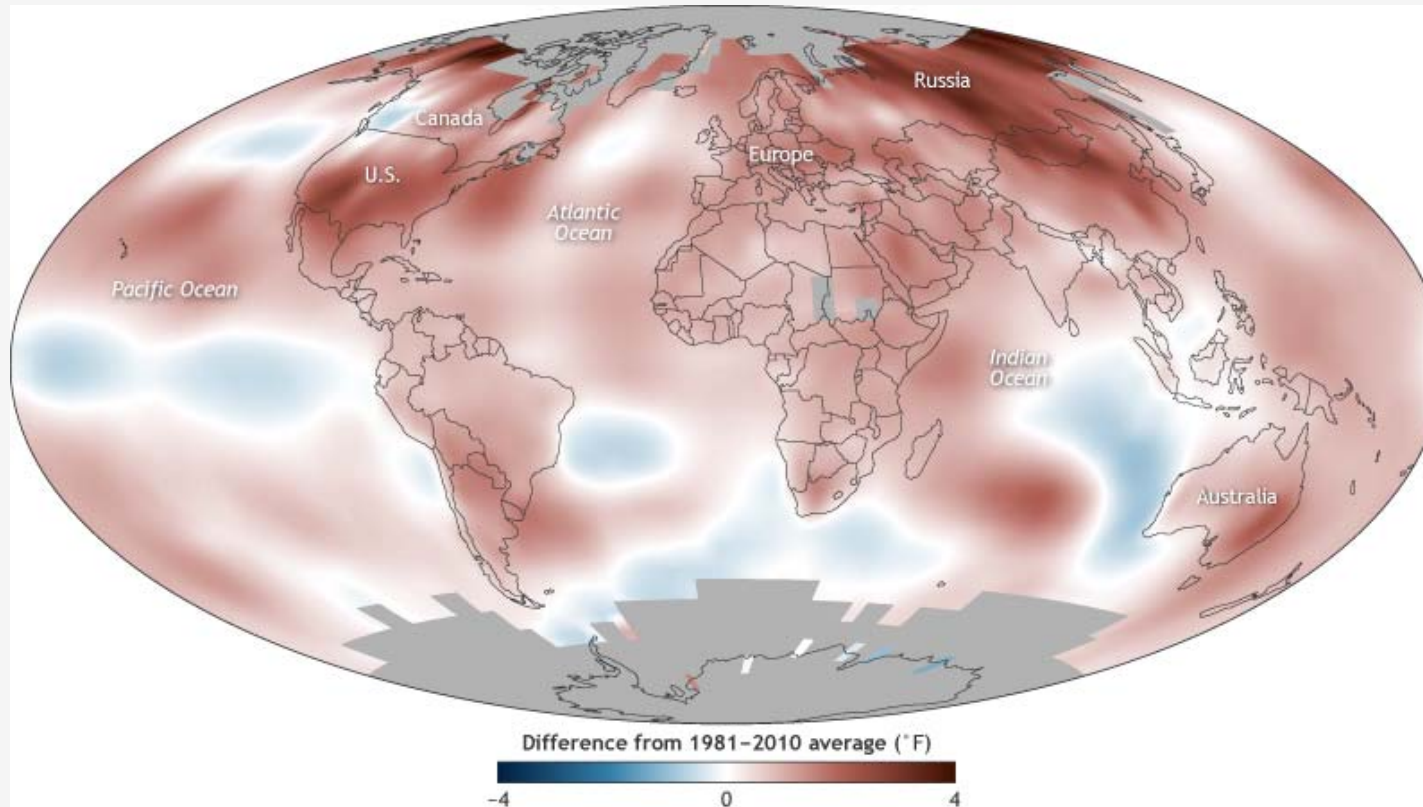
Carbon dioxide over time (1980-2017)

GLOBAL ATMOSPHERIC CARBON DIOXIDE SETS NEW RECORD HIGH IN 2017



NOAA Climate.gov, adapted from State of the Climate 2017

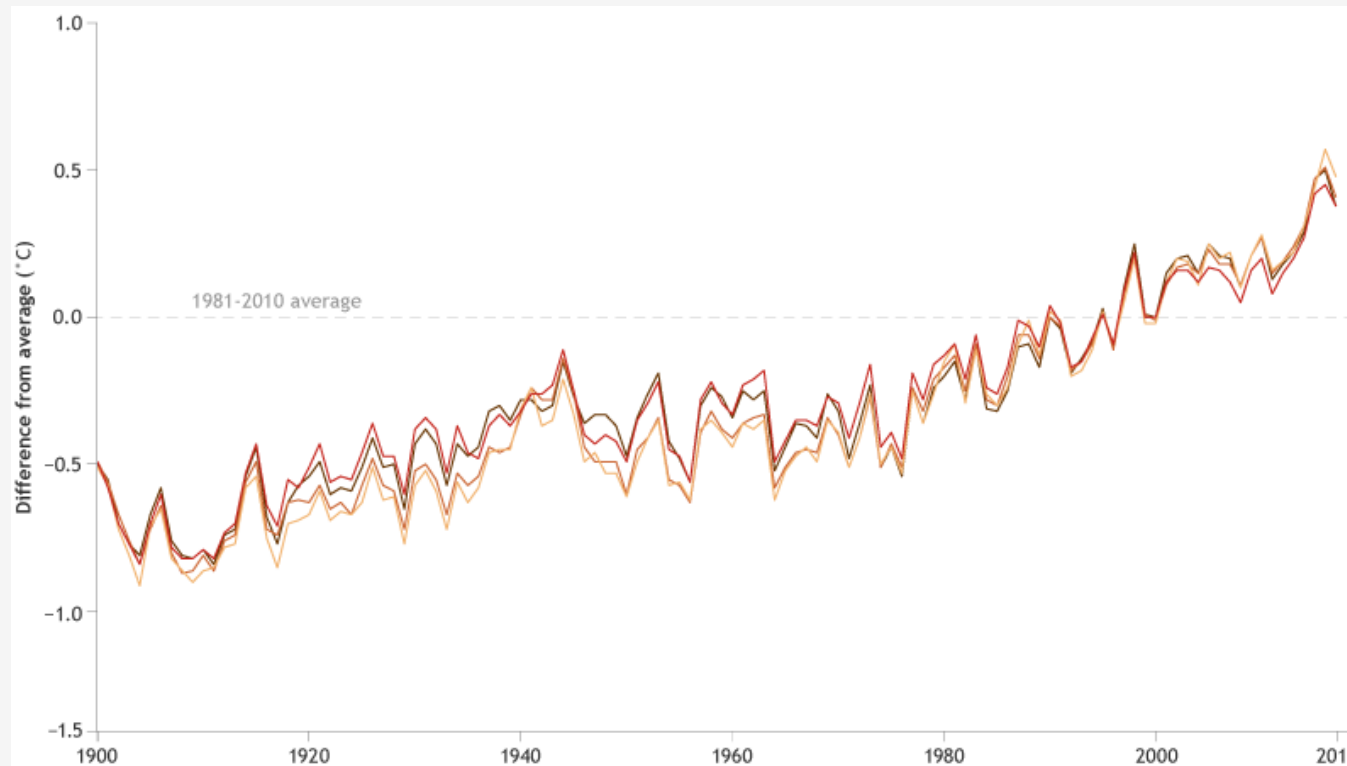
Surface Temperature in 2017



Surface temperature 2017 was **0.38–0.48° Celsius** (0.68–0.86° Fahrenheit) above the 1981–2010 average, with especially warm conditions in the high latitudes of North America and Russia. It was the warmest non-El Niño year in the instrumental record.

Source: NOAA <https://www.climate.gov/news-features/understanding-climate/state-climate-highlights/2017>

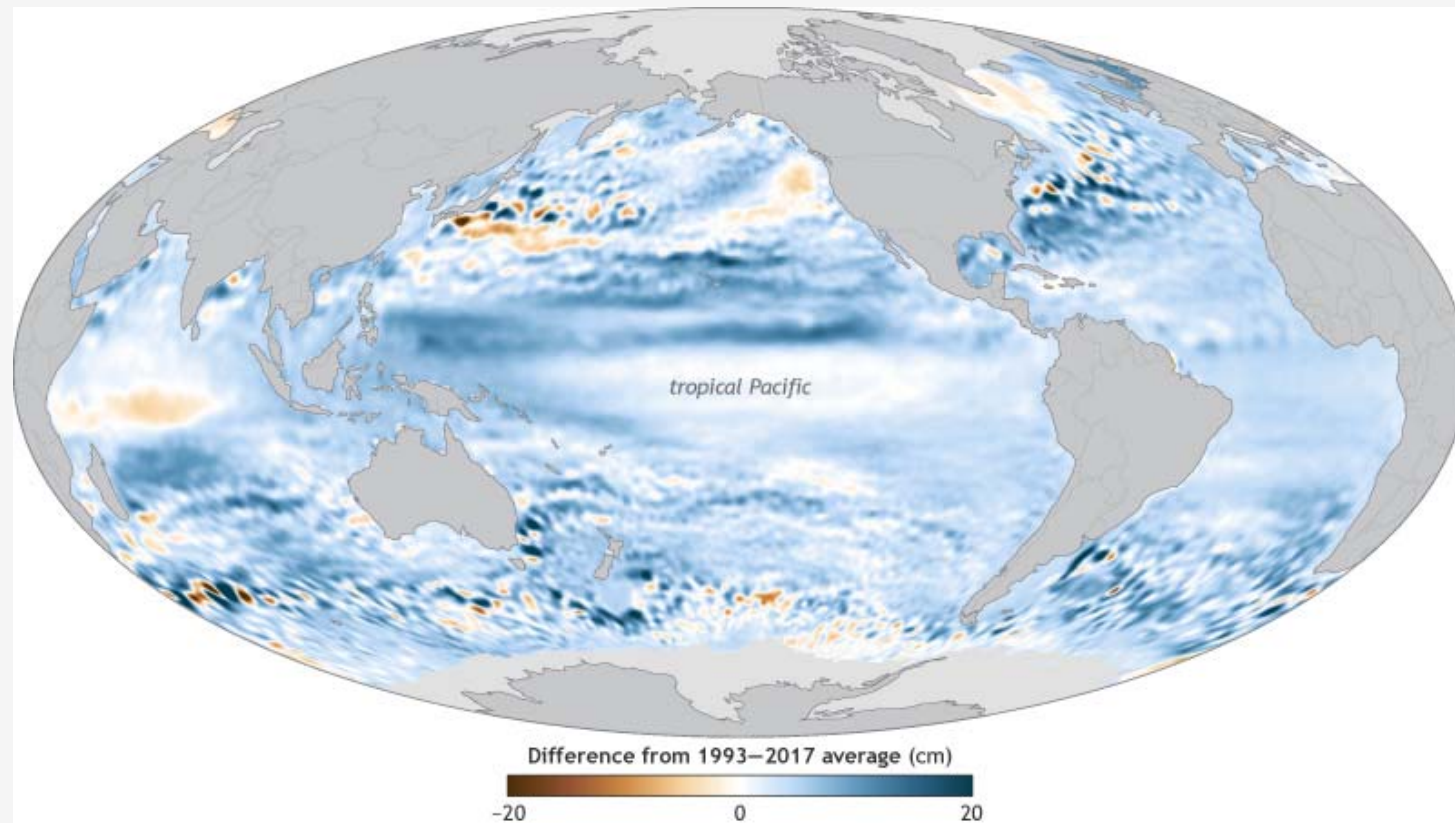
Surface Temperature over time (1900-2017)



Since 1901, the planet's surface has warmed by **0.7–0.9° Celsius (1.3–1.6° Fahrenheit) per century**, but the rate of warming has nearly doubled since 1975 to **1.5–1.8° Celsius (2.7–3.2° Fahrenheit) per century**. The 10 warmest years on record have all occurred since 1998, and the four warmest years on record have all occurred since 2014.

Source: NOAA <https://www.climate.gov/news-features/understanding-climate/state-climate-highlights/2017>

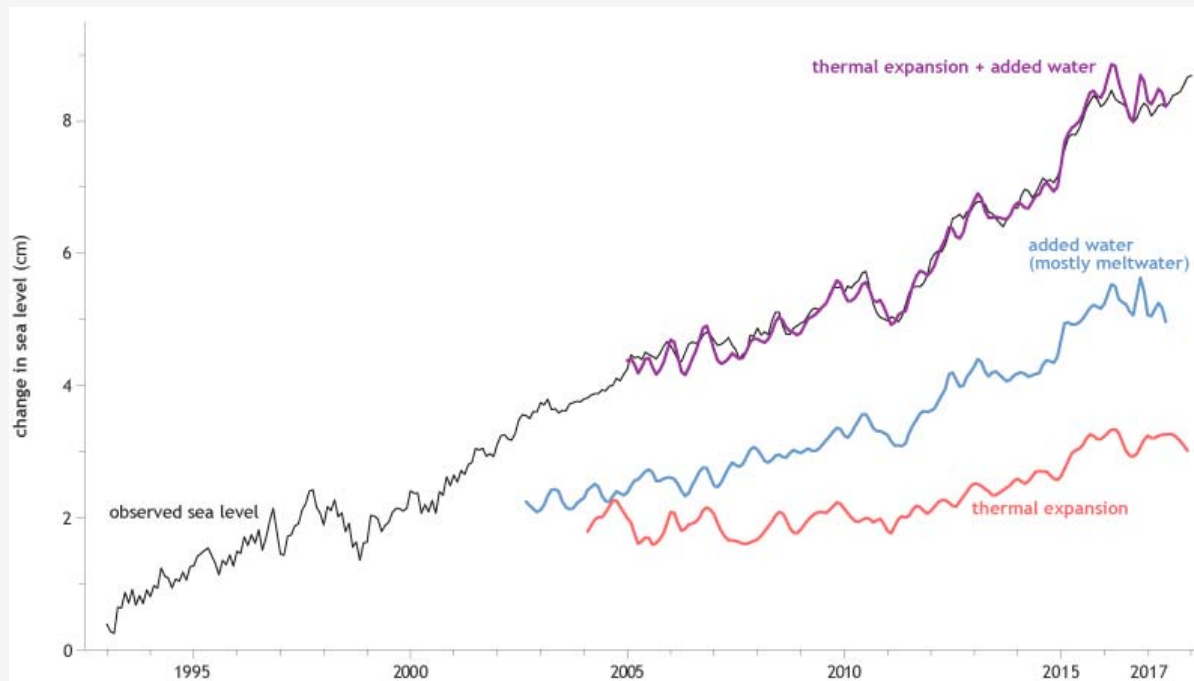
Sea Level in 2017



Sea level in 2017: Global mean sea level in 2017 was the highest in the satellite record—77 millimeters (3 inches) higher than it was in 1993. Sea levels were higher than average over most of the globe, in keeping with the long-term upward trend. Sea levels were close to their long-term average in the central tropical Pacific, making the area a relative low spot.

Source: NOAA <https://www.climate.gov/news-features/understanding-climate/state-climate-highlights/2017>

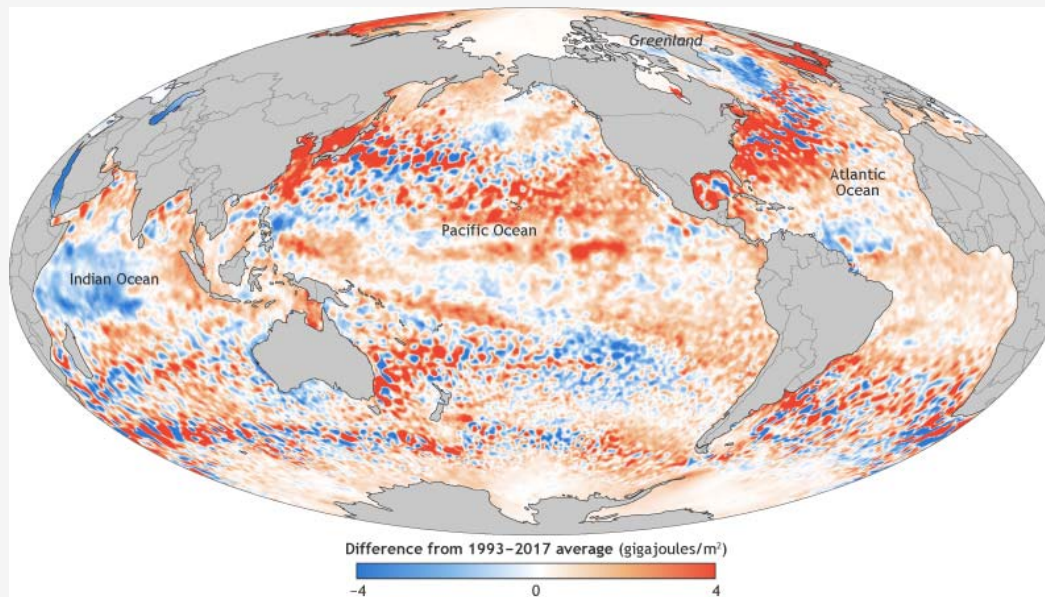
Sea Level over time (1993-2017)



Sea level over time (1993-2017): 2017 set a new record for global sea level. The average rate of sea level rise since 1993 is 3.1 millimeters (0.12 inches) per year, and the increase has been accelerating by 0.084 millimeters (three thousandths of an inch) per year each year. Sea level rise is increasing the severity and frequency of coastal flooding in many parts of the world.

Source: NOAA <https://www.climate.gov/news-features/understanding-climate/state-climate-highlights/2017>

Ocean heat in 2017

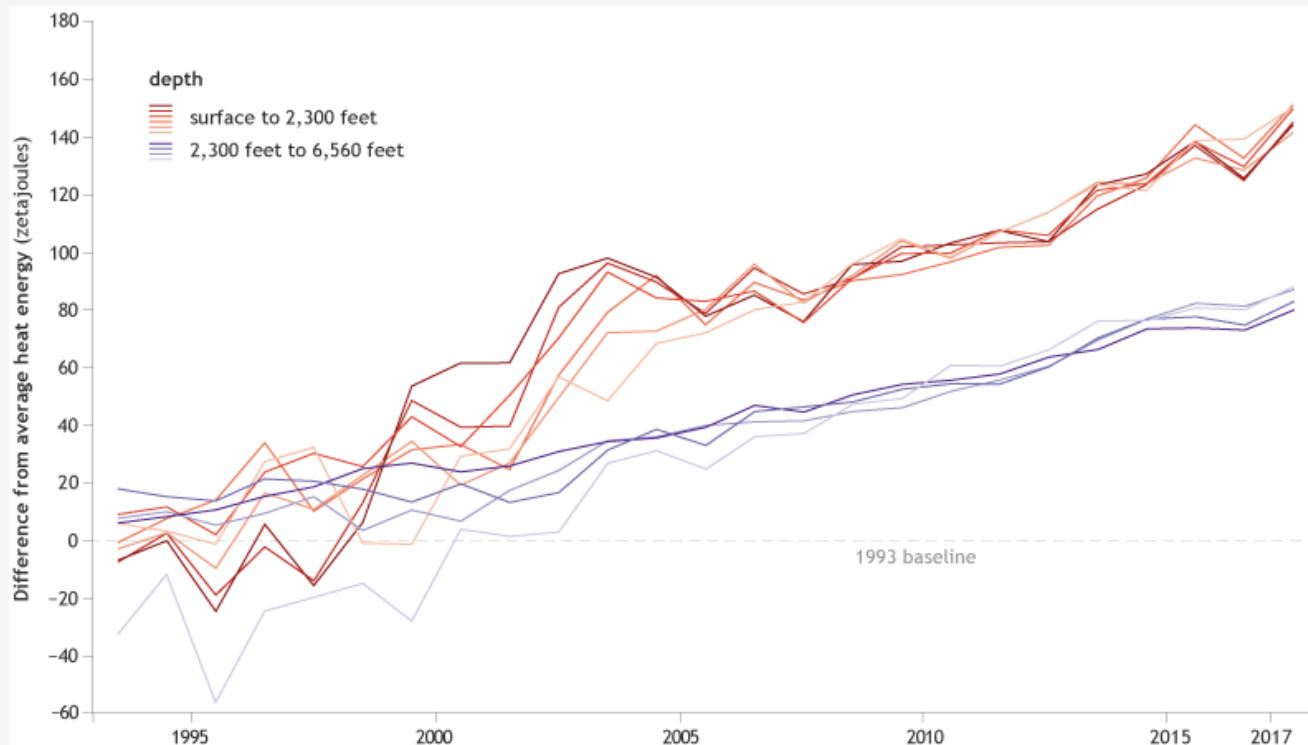


Ocean heat in 2017

More than 90 percent of the excess heat absorbed by the climate system due to human-caused greenhouse gas warming is stored in the ocean.

Source: NOAA <https://www.climate.gov/news-features/understanding-climate/state-climate-highlights/2017>

Ocean heat overtime (1993-2017)

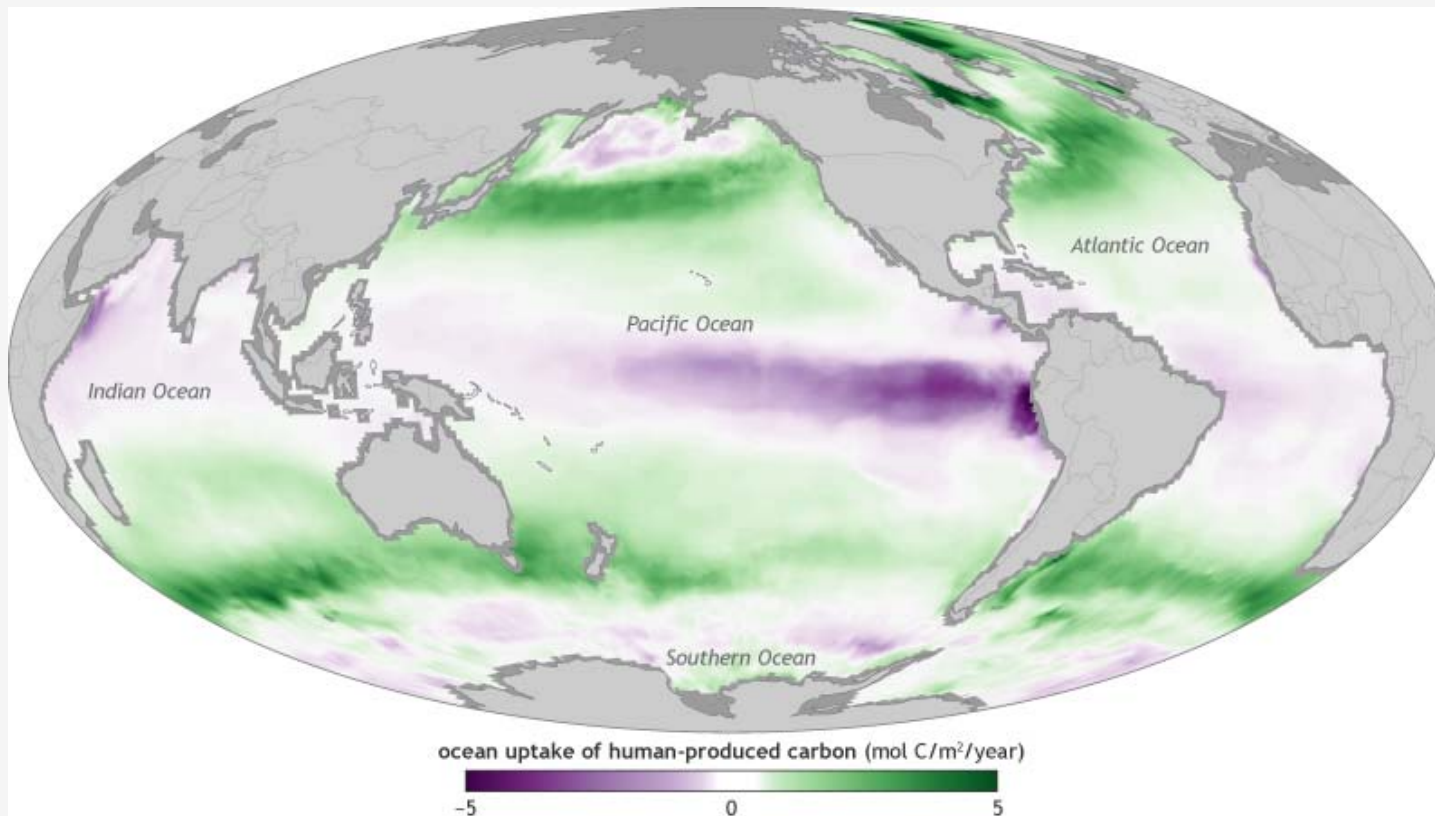


Ocean heat over time (1993-2017)

Human-produced greenhouse gases are slowing the rate at which heat escapes into space. Between 1993 and 2017, the global ocean has gained 0.36–0.40 watts of heat energy per square meter near the surface (0–700 meters) and 0.19–0.35 watts per square meter at deeper levels (700–2,000 meters).

Source: NOAA <https://www.climate.gov/news-features/understanding-climate/state-climate-highlights/2017>

Ocean uptake of human-induced carbon 2017



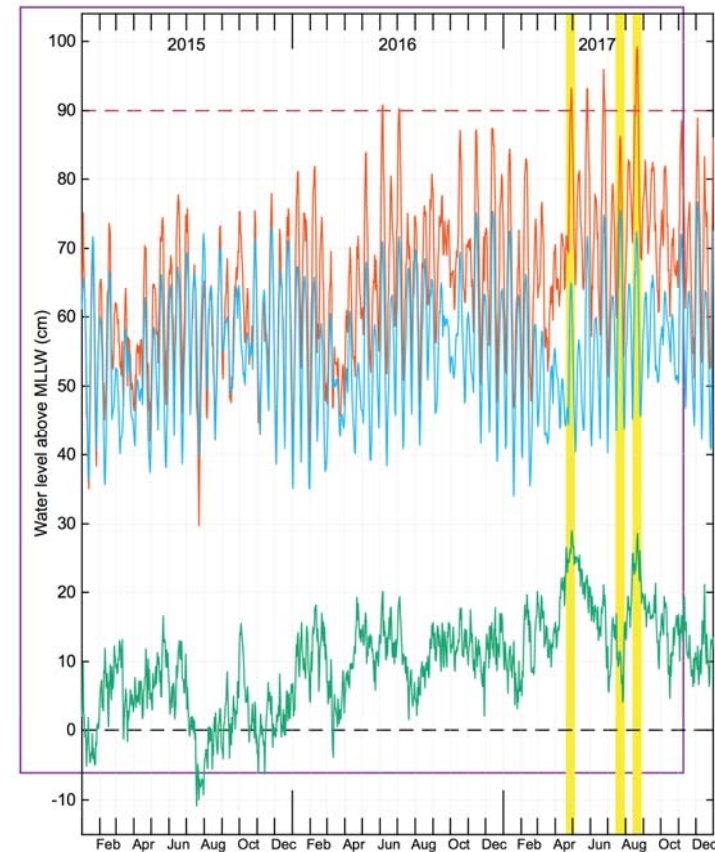
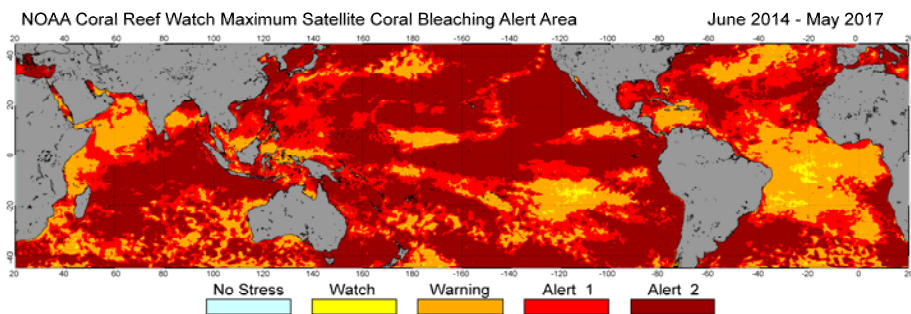
Ocean uptake of human-produced carbon in 2017

In 2017, the ocean absorbed 2.6 petagrams of human-produced carbon, which is 36% higher than the 2005-2015 average. By absorbing human-produced carbon dioxide, the ocean reduces the amount of warming those emissions would otherwise cause, but it increases the water's acidity, which harms ocean life.

Source: NOAA <https://www.climate.gov/news-features/understanding-climate/state-climate-highlights/2017>

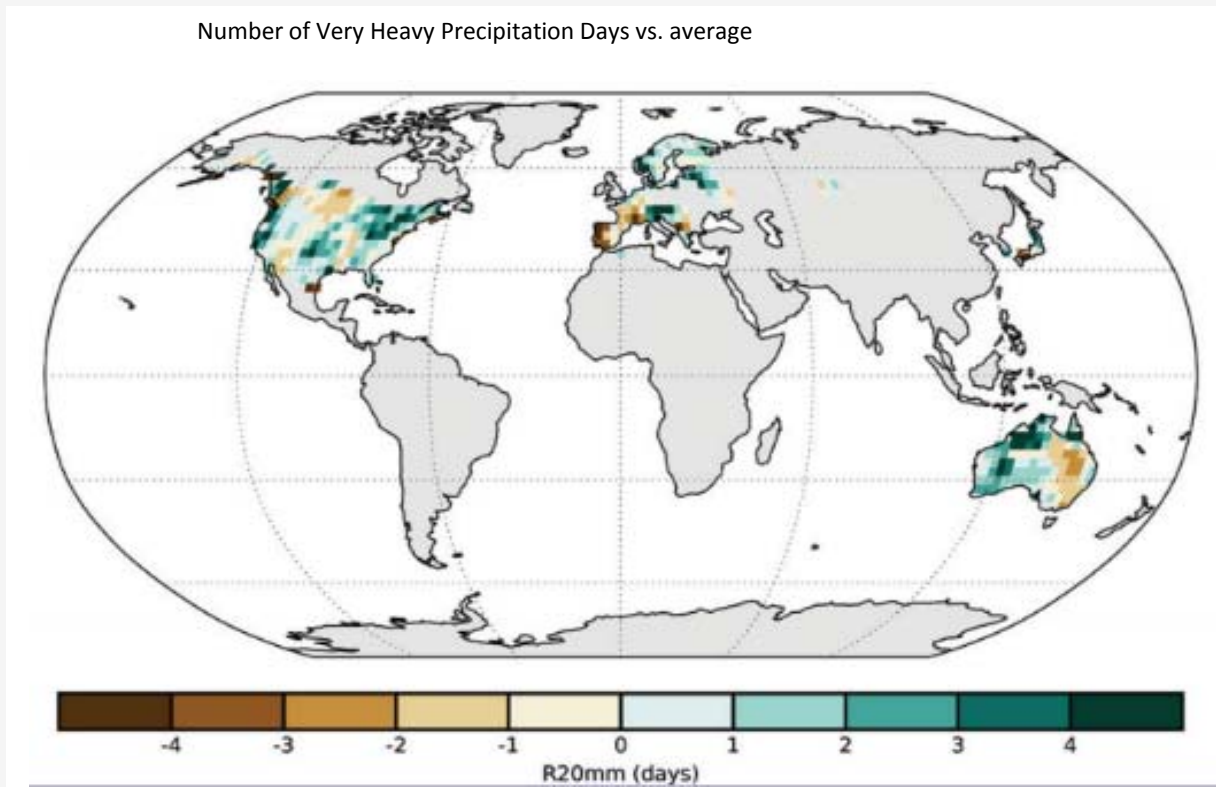
Impacts: Global Oceans Chapter Sidebars

- Warm Sea Surface Temperatures:
Unprecedented Three Years of Global Coral Reef Bleaching 2014–17



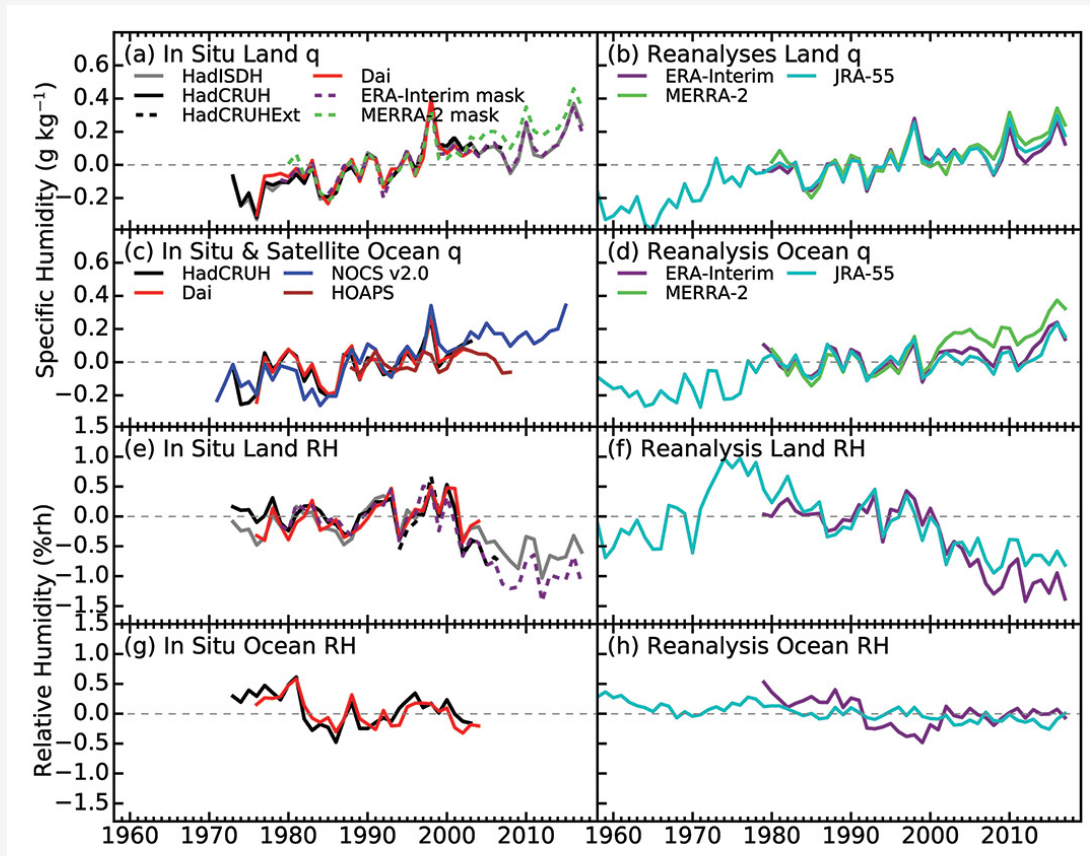
One occurring theme: extreme precipitation

- In addition to documenting extreme events on every inhabited continent, sidebars focused on methods to characterize extreme precipitation.



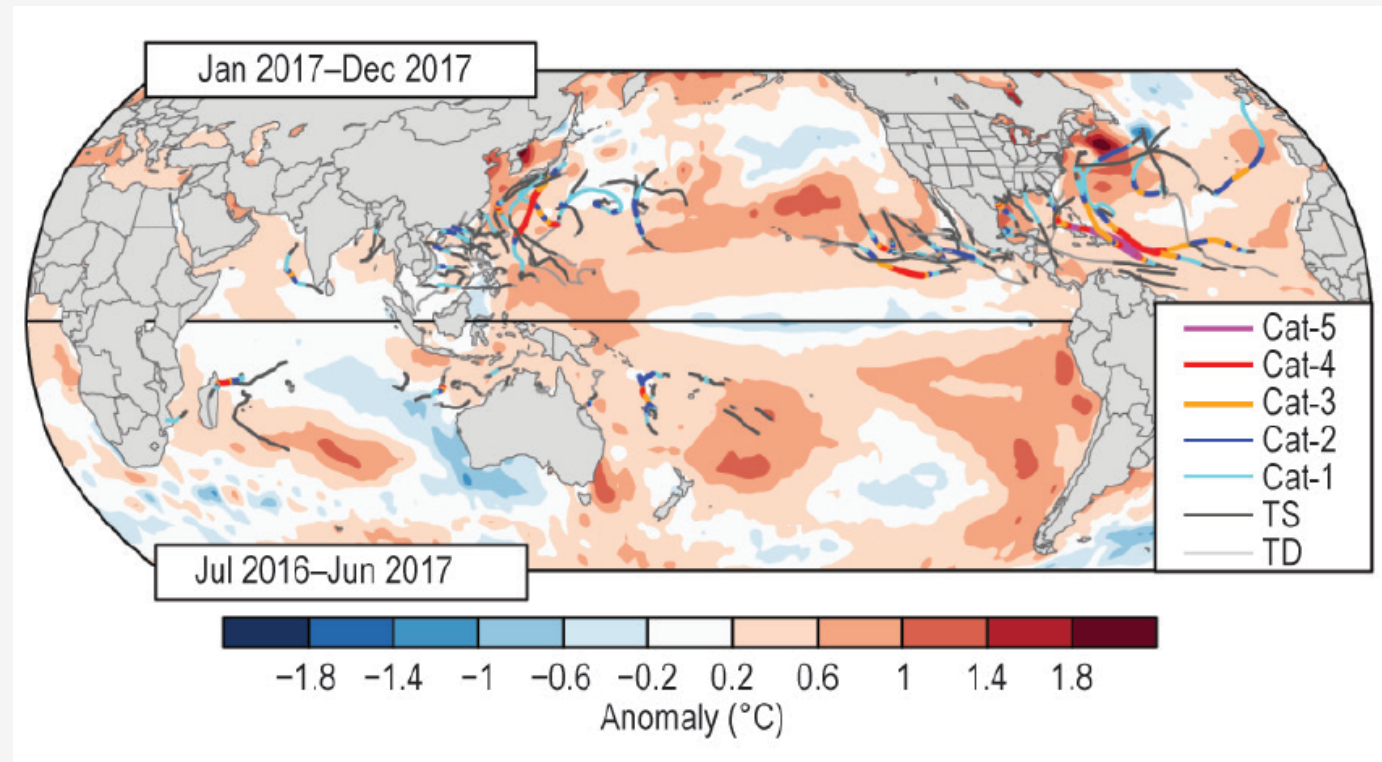
Humidity

General trends indicate increasing water vapor and slightly decreasing relative humidity



Tropical cyclones

- 85 named storms globally
 - Slightly above average of 82
- North Atlantic Basin Accumulated Cyclone Energy index roughly 2.4 times its median value
 - Three catastrophic major hurricanes: Harvey, Irma, Maria
- Other basins near or below normal



For More Information

Link to Full Report:

<https://www.ametsoc.org/ams/index.cfm/publications/bulletin-of-the-american-meteorological-society-bams/state-of-the-climate/>

