A world map showing temperature anomalies for 2018. The map is overlaid with a grid of colored squares. Most of the globe is shaded in red, indicating warmer than average temperatures. The United States is shaded in a lighter red, indicating it was the 3rd wettest year. A blue horizontal bar is positioned above the main title.

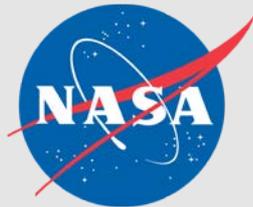
**NOAA/NASA**

# Annual Global Analysis for 2018

*2018 was 4<sup>th</sup> warmest for globe, 3<sup>rd</sup> wettest for US*

**Gavin A. Schmidt**

*Director, NASA's Goddard Institute  
for Space Studies*



**Derek Arndt**

*Chief, Monitoring Branch, NOAA's National  
Centers for Environmental Information*



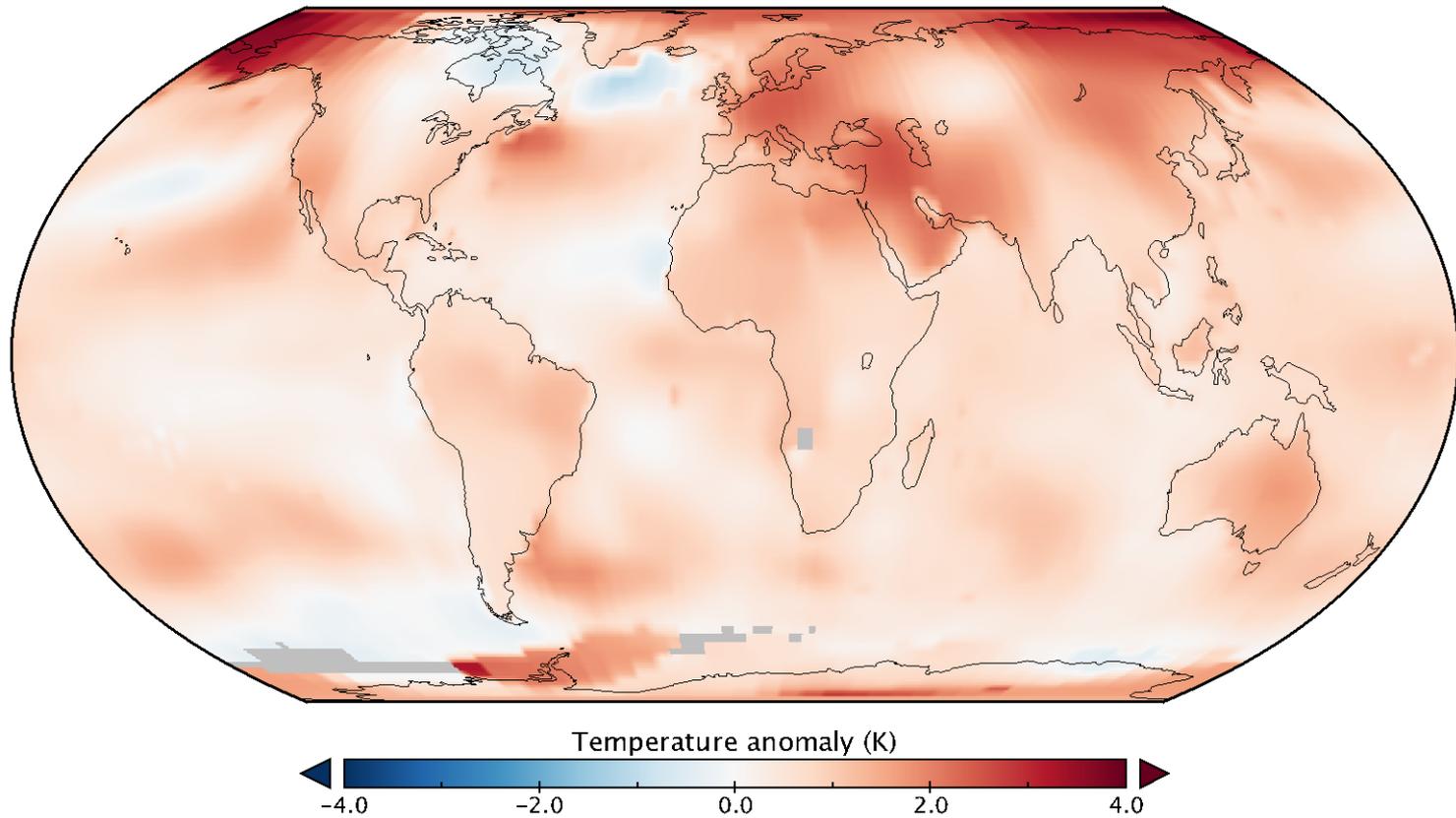
# NASA 2018 Global Temperature

**2018:**

0.83°C / 1.49°F  
above 1951-80  
average

4<sup>th</sup> Warmest  
year of NASA  
GISTEMP record

GISTEMP Annual Mean 2018  
Baseline 1950-1981



# NOAA 2018 Global Temperature

0.79°C / 1.42°F above 1901-2000 average; 4<sup>th</sup> warmest year of record

## Record warmth

Much of: Europe, the Mediterranean, the Middle East, New Zealand and nearby ocean, and parts of the Atlantic and western Pacific

## ENSO

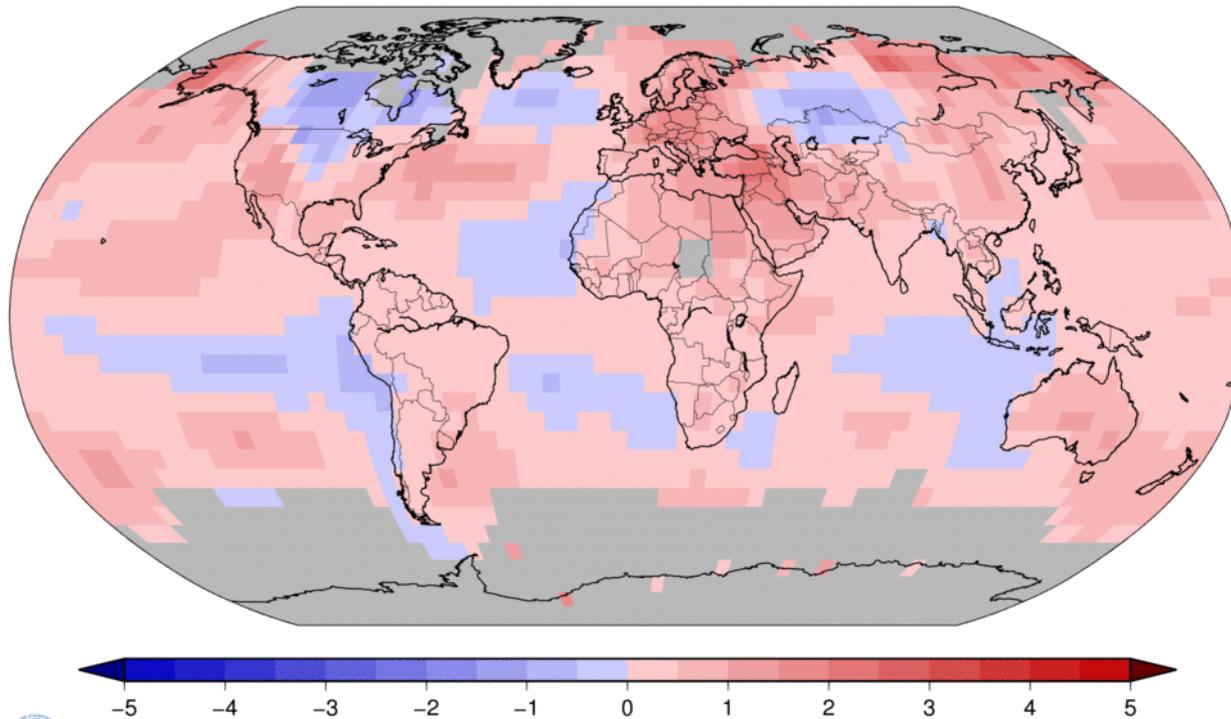
Neutral conditions prevailed most of the year

## South of 20°S latitude:

Warmest year of record for 2<sup>nd</sup> consecutive year

## Land & Ocean Temperature Departure from Average Jan–Dec 2018 (with respect to a 1981–2010 base period)

Data Source: GHCN–M version 3.3.0 & ERSST version 4.0.0



National Centers for Environmental Information  
Thu Jan 31 15:29:20 EST 2019

Degrees Celsius

Please Note: Gray areas represent missing data  
Map Projection: Robinson

## Continental Temperatures

records begin 1910

### Europe

warmest year on record, nominally

### France, Germany, Switzerland

Warmest year on record

### Africa; Oceania

among 5 warmest years

### Asia; S. America

among 10 warmest years

### N. America

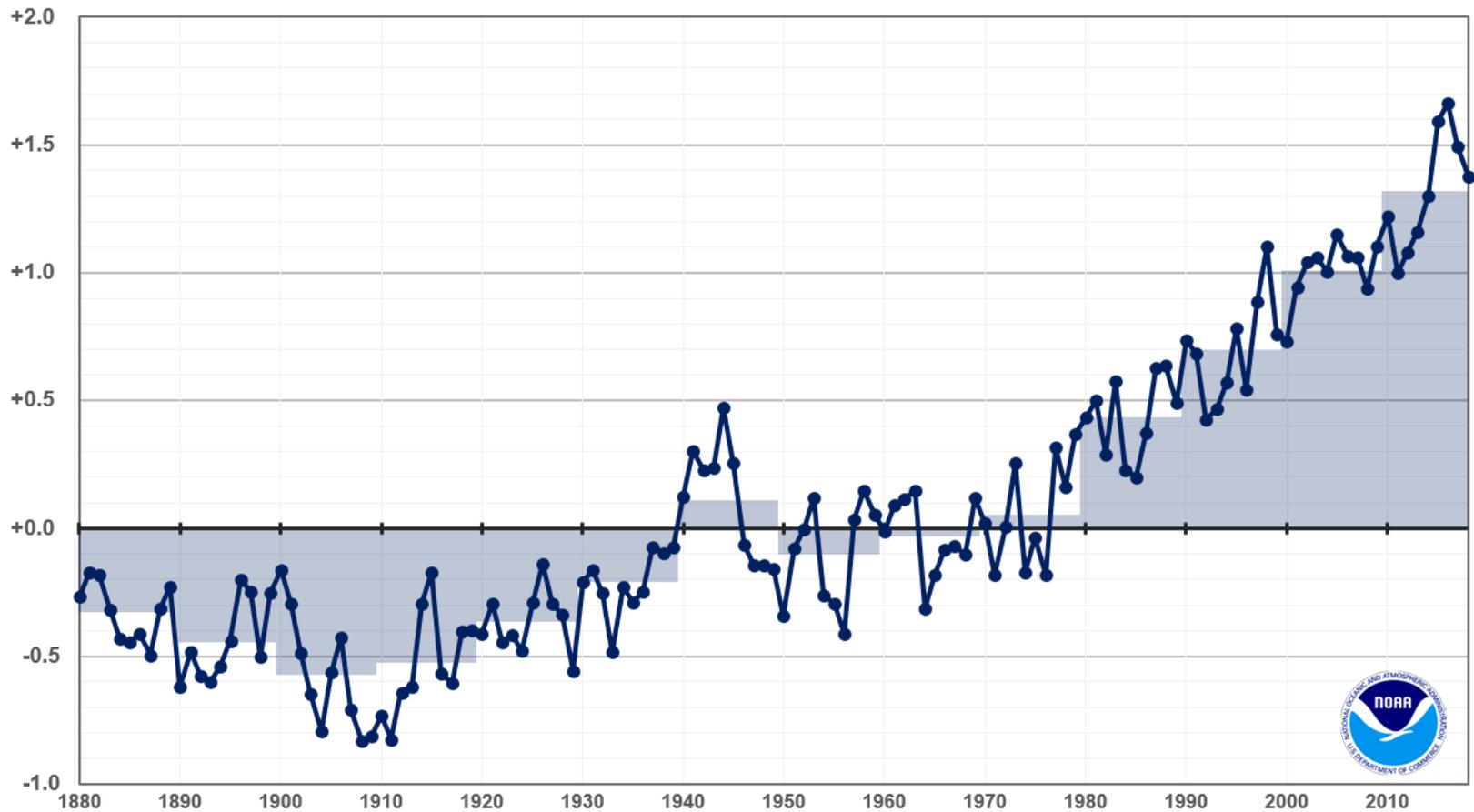
among 20 warmest years



# Global Temperature Time Series

## NOAA GlobalTemp

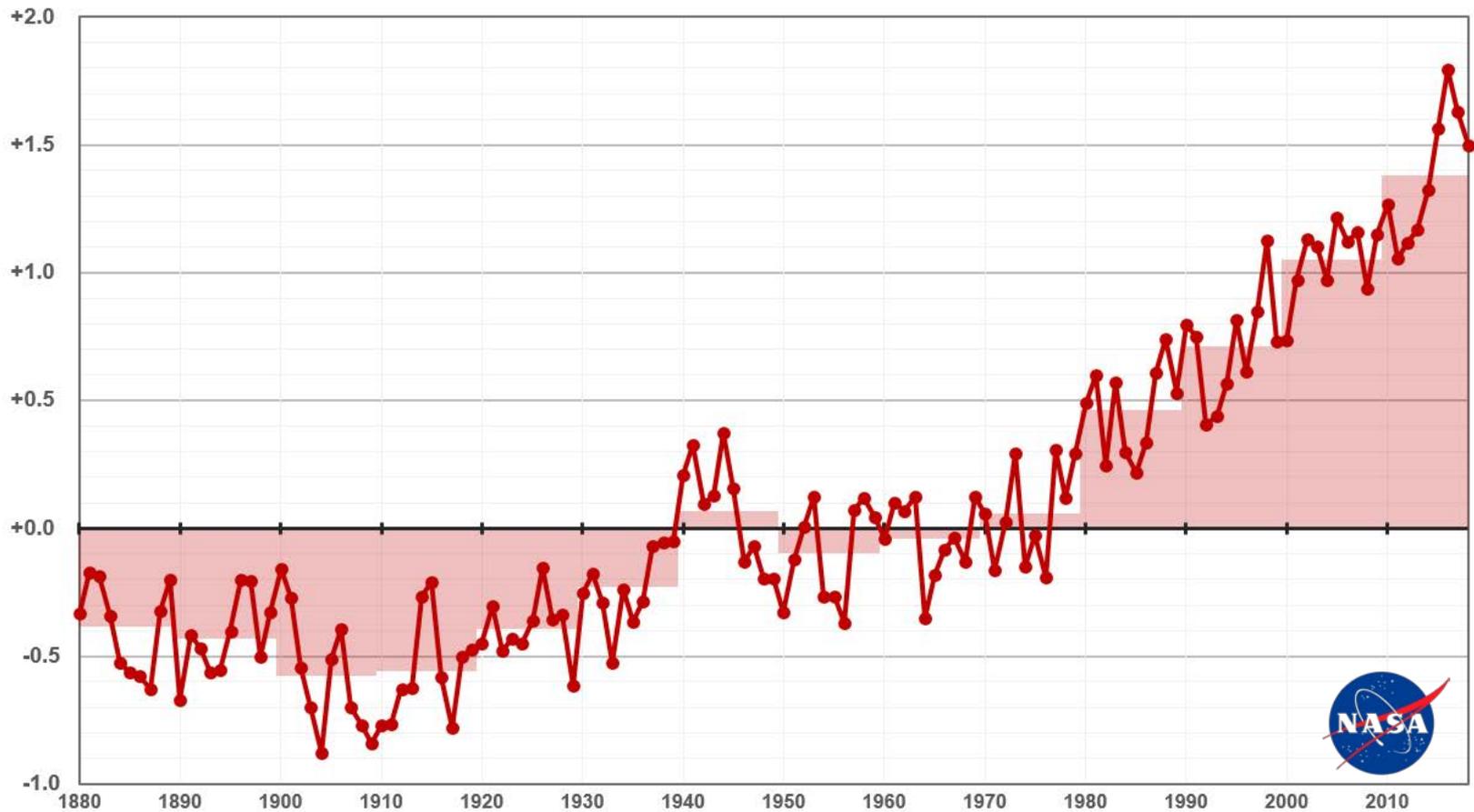
Annual Global Temperature: Difference From 1951-80 Average, in °F



# Global Temperature Time Series

## NASA GISTEMP

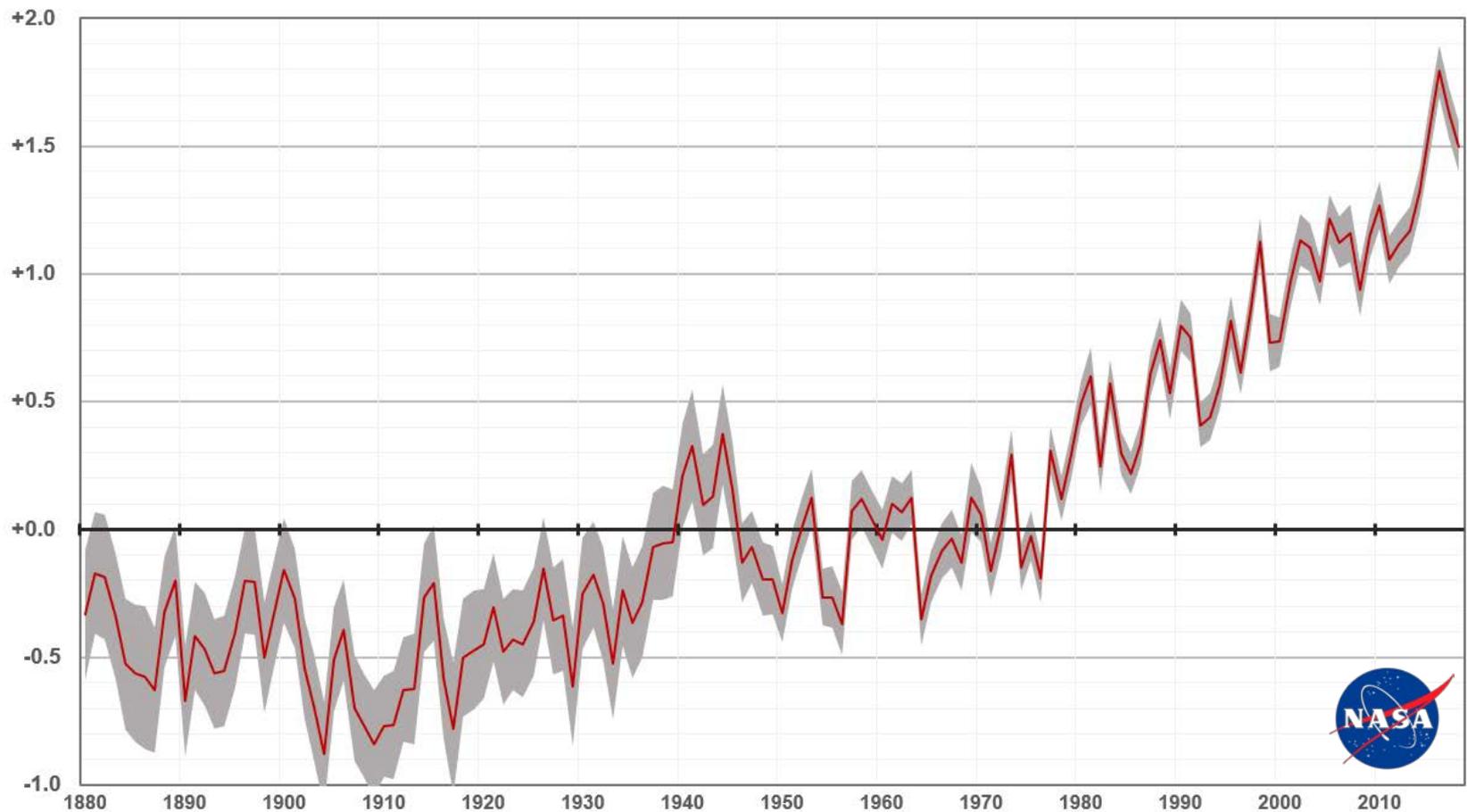
Annual Global Temperature: Difference From 1951-80 Average, in °F



# Global Temperature Time Series

## NASA GISTEMP

Annual Global Temperature: Difference From 1951-80 Average, in °F

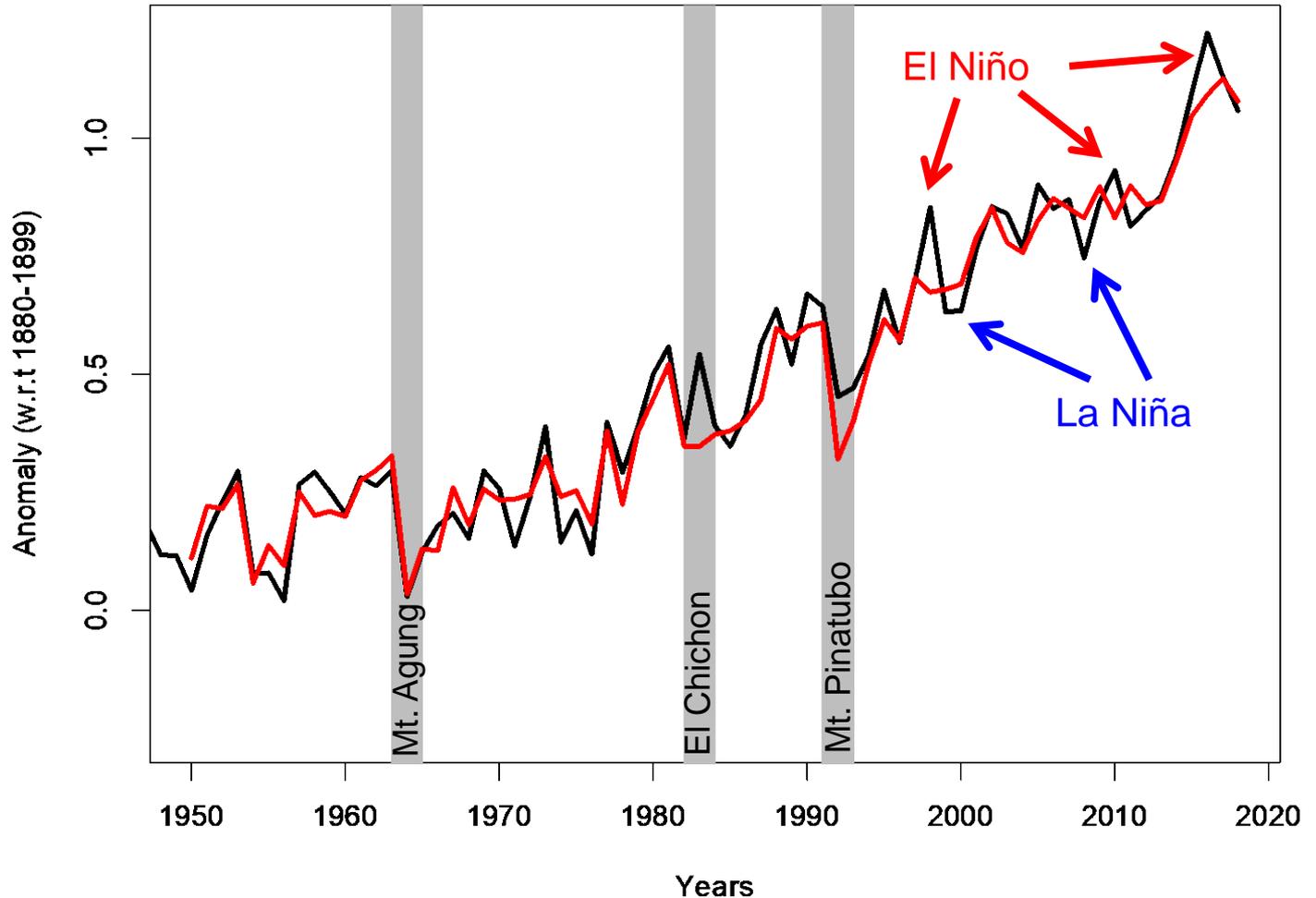


# Impact of ENSO on NASA analysis

Maximum correlation to annual mean is Feb-Mar ENSO index

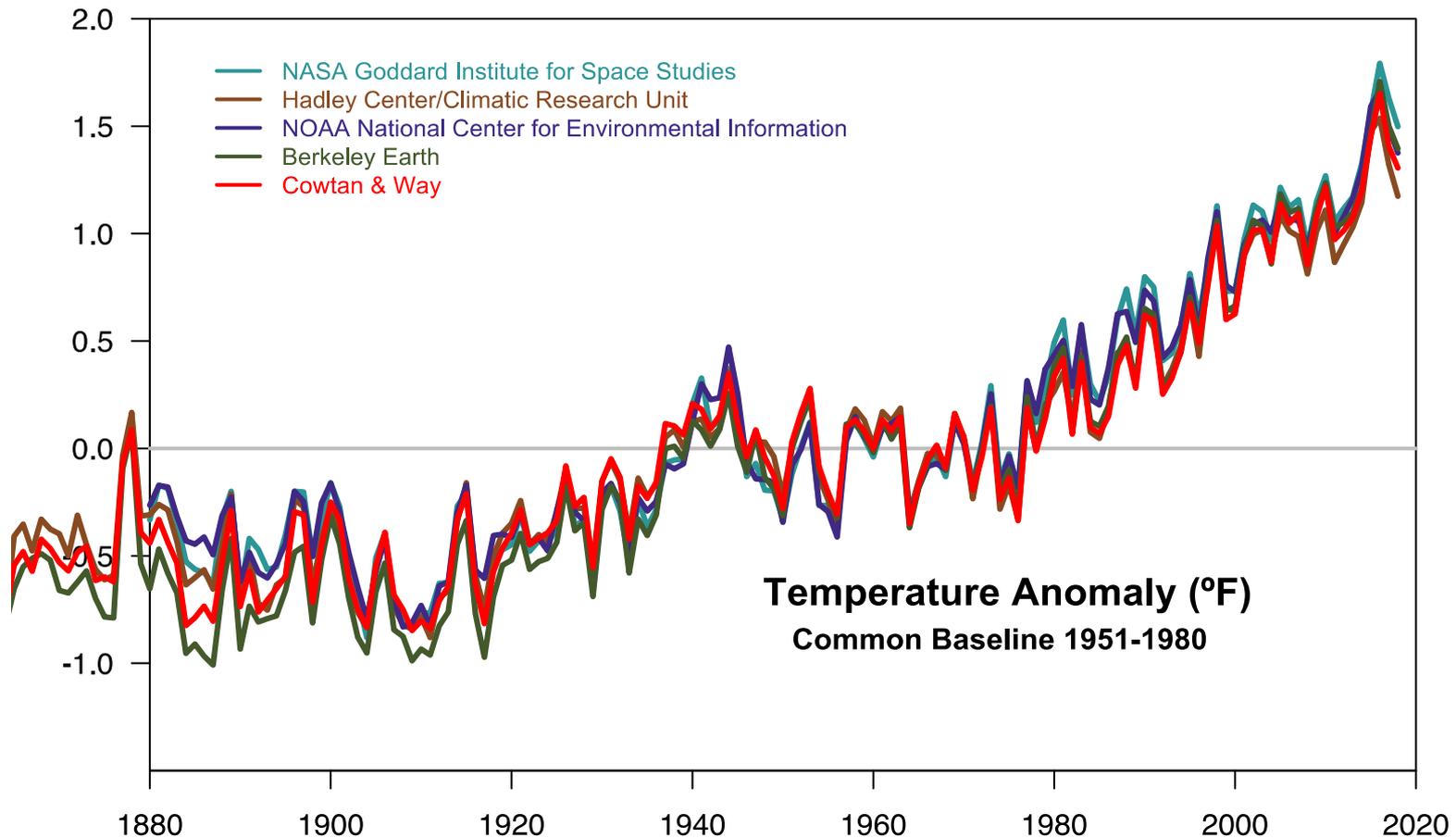
ENSO contribution to specific years:

- 2015: 0.05°C
- 2016: 0.13°C
- 2017: 0.00°C
- 2018: -0.02°C



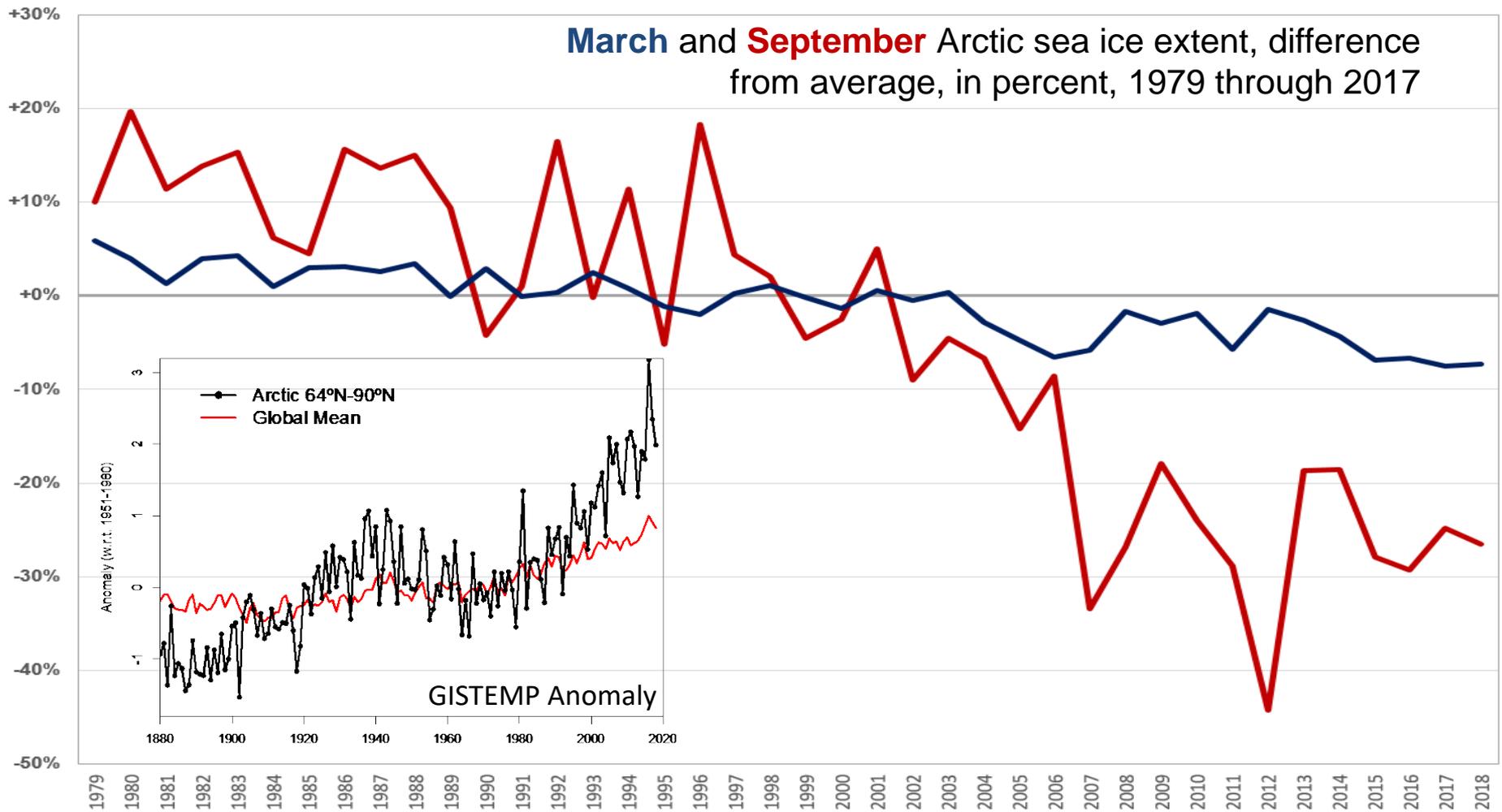
# Global Analyses Side by Side

Several major datasets: relative to a common 1951-1980 base period



# Arctic Sea Ice Extent Since 1979

(inset: Arctic temperature change vs. Global average)



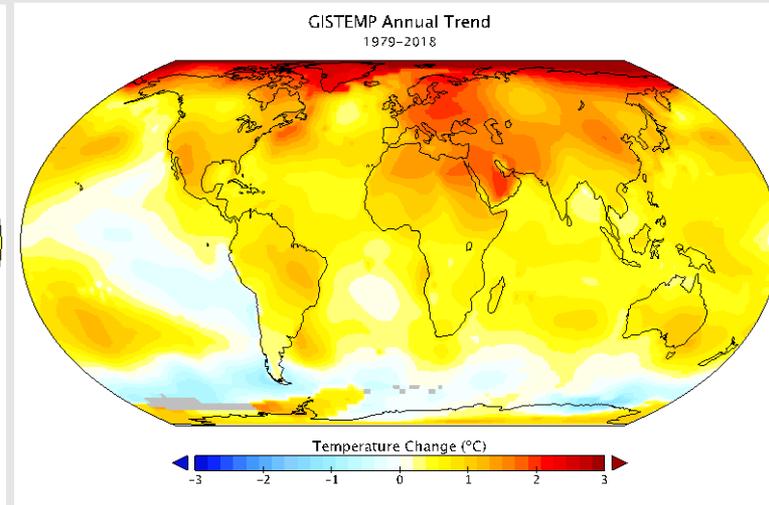
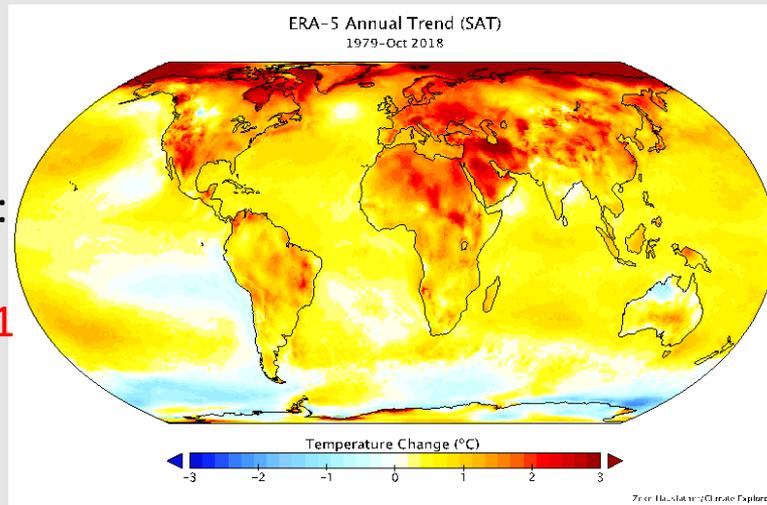
# Evaluation against Reanalyses (ERA5) and Remote Sensing (AIRS)

ERA-5 is the latest reanalysis from ECMWF.

Trends 1979-2018:

ERA5:  $0.72^{\circ}\text{C}$

GISTEMP:  $0.68 \pm 0.1^{\circ}\text{C}$  (95%CI)

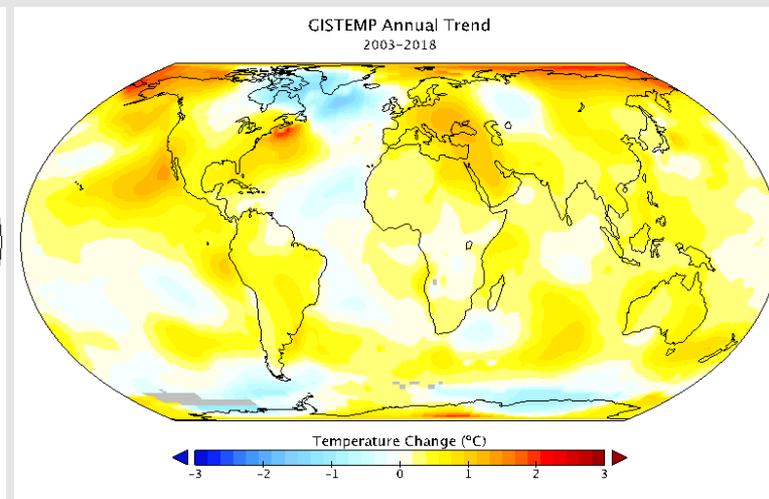
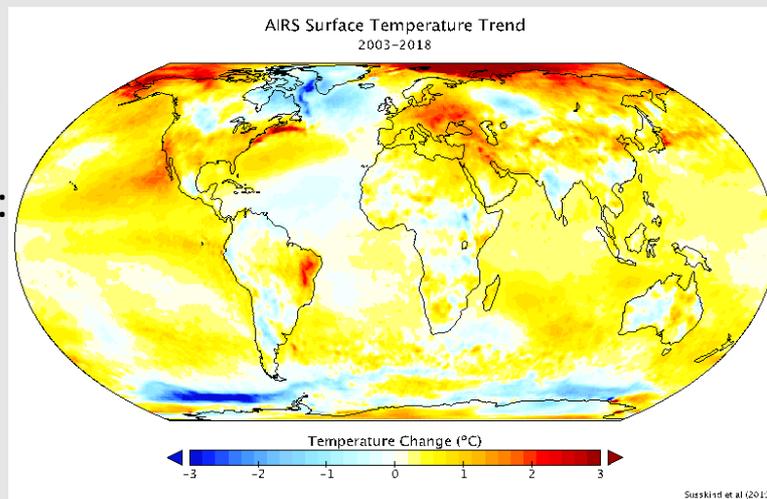


AIRS is an IR instrument on Eos Aqua.

Trends 2003-2018:

AIRS:  $0.36^{\circ}\text{C}$

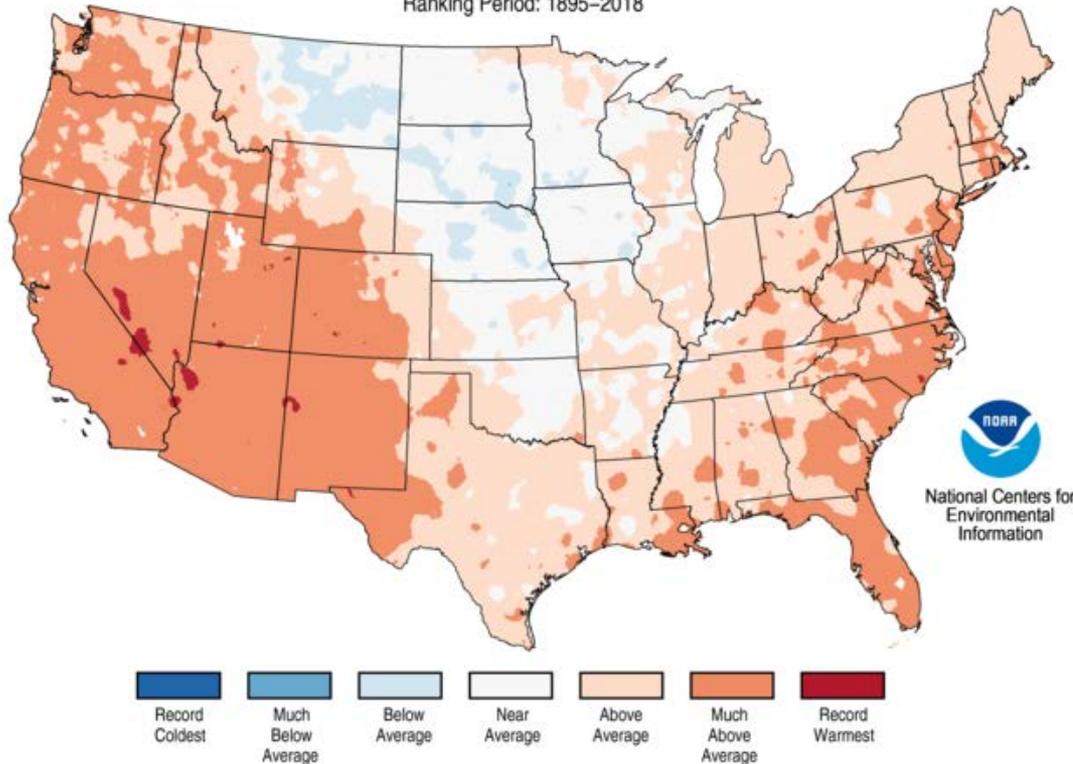
GISTEMP:  $0.35 \pm 0.17^{\circ}\text{C}$



# U.S. Climate Conditions: 2018

Temperature: 53.5°F; 1.5°F above 20<sup>th</sup> century average; 14<sup>th</sup> warmest

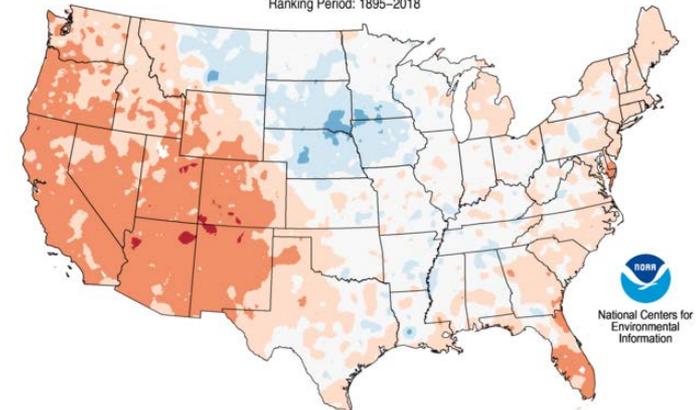
Mean Temperature Percentiles  
January–December 2018  
Ranking Period: 1895–2018



National Centers for Environmental Information

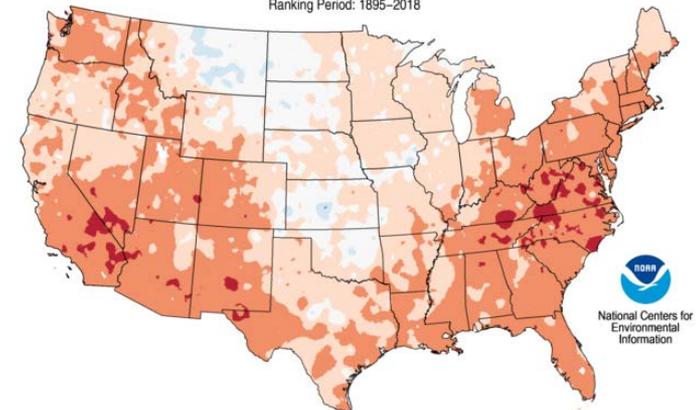
Data Source: 5km Gridded Dataset (nClimGrid)

Maximum Temperature Percentiles  
January–December 2018  
Ranking Period: 1895–2018



National Centers for Environmental Information

Minimum Temperature Percentiles  
January–December 2018  
Ranking Period: 1895–2018



National Centers for Environmental Information

Data Source: 5km Gridded Dataset (nClimGrid)



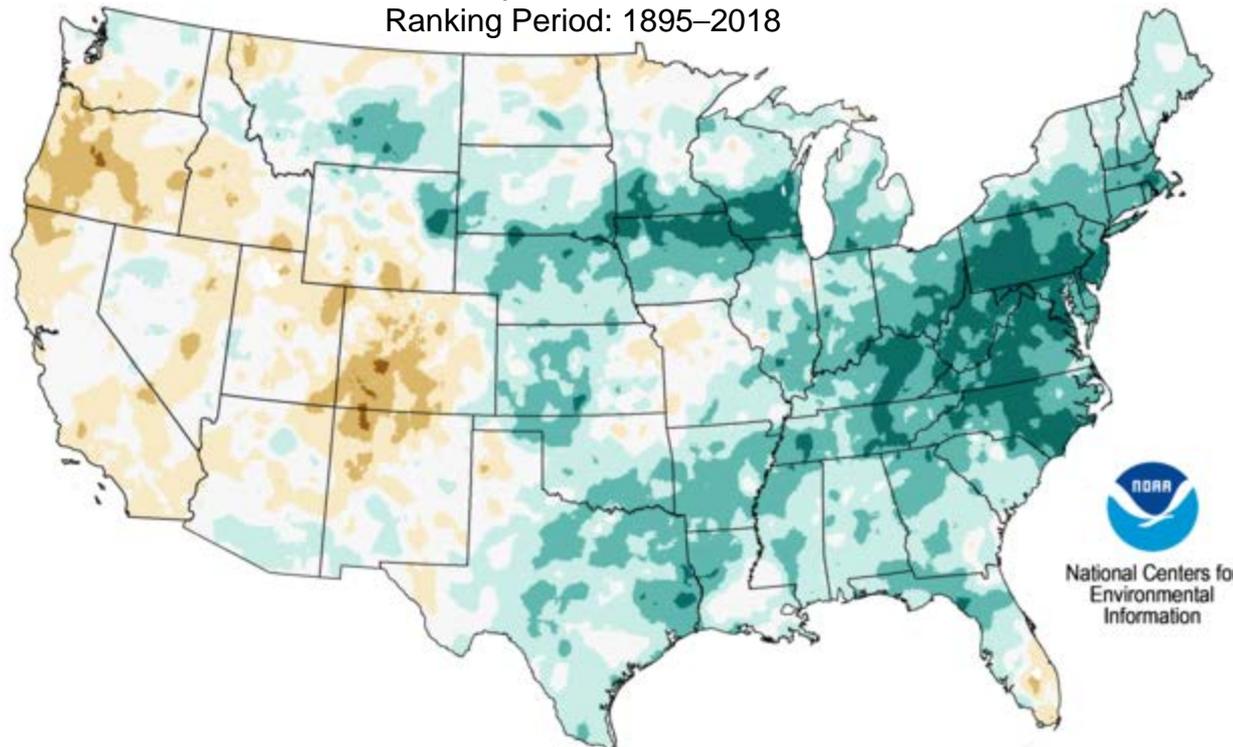
# U.S. Climate Conditions: 2018

Precipitation: 34.63 in.; 4.69 in. above 20<sup>th</sup> century average; 3<sup>rd</sup> wettest

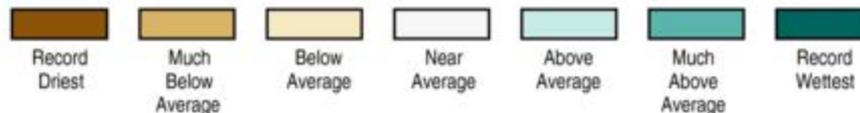
## Total Precipitation Percentiles

January–December 2018

Ranking Period: 1895–2018



National Centers for  
Environmental  
Information

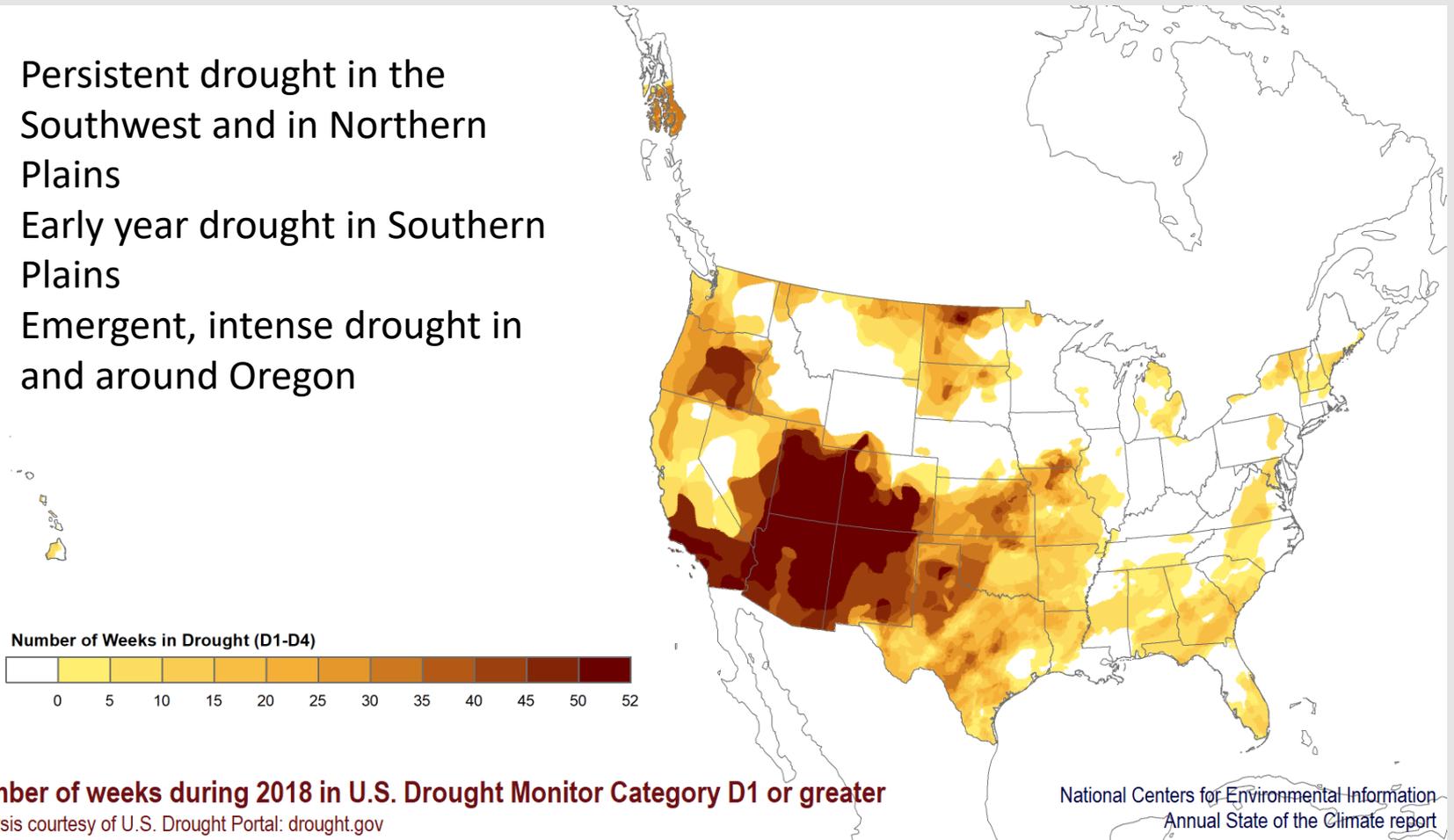


Data Source: 5km Gridded Dataset (nClimGrid)



# U.S. Drought Conditions: 2018

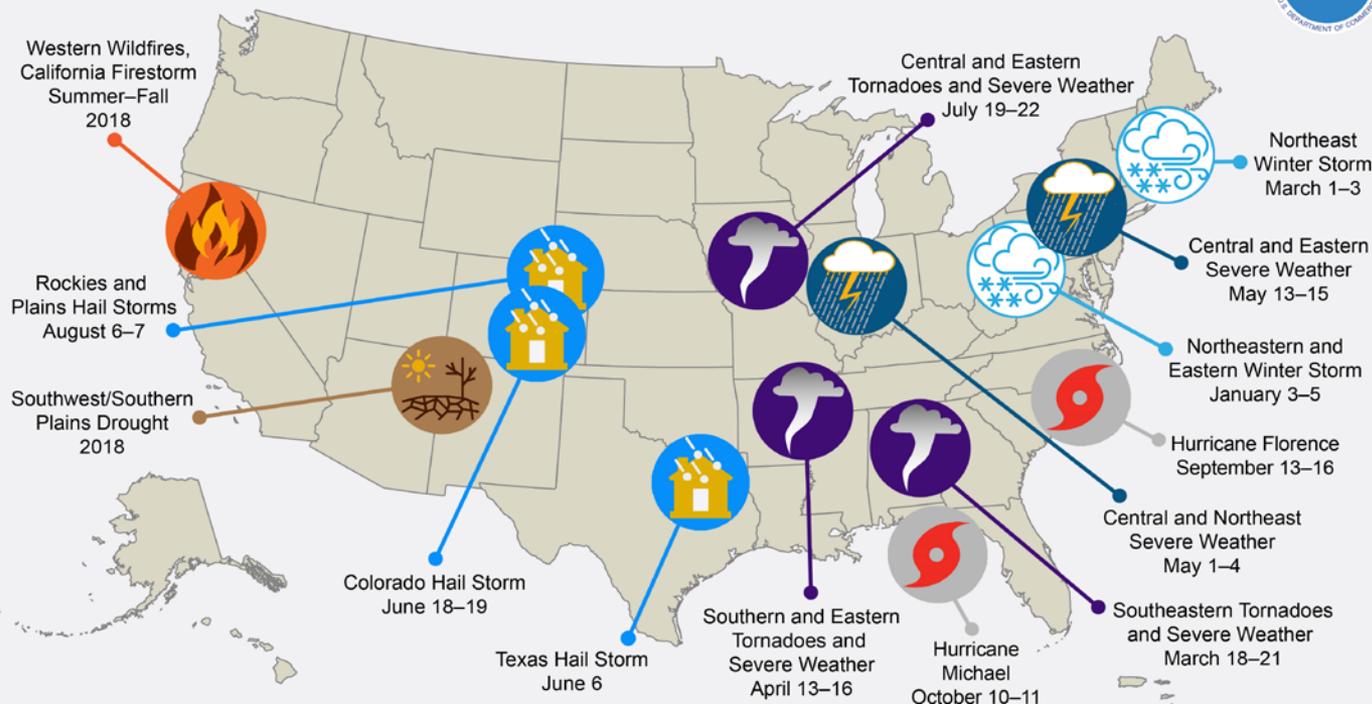
- Persistent drought in the Southwest and in Northern Plains
- Early year drought in Southern Plains
- Emergent, intense drought in and around Oregon



# U.S. Billion Dollar Disasters

14 events in 2018

## U.S. 2018 Billion-Dollar Weather and Climate Disasters



This map denotes the approximate location for each of the 14 separate billion-dollar weather and climate disasters that impacted the United States during 2018.

**14 Billion Dollar Disasters**

4<sup>th</sup> largest total of the 1980–2018 record

**Accounted for \$91B in direct losses**  
4<sup>th</sup> largest total on record

Michael: \$25B  
Florence: \$24B  
Western wildfires: \$24B



# Questions?

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