

## U.S. NEWS

# Last Decade Was Warmest On Record

NASA, NOAA ranked 2019 as the second-hottest year in tracking dating to 1880

By ROBERT LEE HOTZ

The world experienced near-record global temperatures in 2019, federal climate scientists said. The year capped what the scientists said was the warmest decade in modern times.

In an annual climate report, scientists at National Aeronautics and Space Administration and the National Oceanic and Atmospheric Administration, which independently track world temperatures, each ranked last year as the second-warmest since systematic record-keeping began in 1880.

"The decade that just ended is clearly the warmest decade on record," said Gavin Schmidt, director of NASA's Goddard Institute for Space Studies in New York. "Every decade since the 1960s clearly has been warmer than the one before."

During 2019, the average temperature across global land and ocean surfaces was 1.8 de-

gree Fahrenheit (0.98 degree Celsius) above the 20th-century mean, with 95% certainty, according to the NASA calculations. The NOAA scientists calculated the average global temperature as 1.71 degrees F (0.95 degree C) above the average for 1901 to 2000. Each agency uses slightly different data sets and techniques to arrive at their results.

Their calculations are in line with a recent assessment by the European Union's Copernicus Climate Change Service, operated by the European Centre for Medium Range Weather Forecasts, which last week ranked 2019 as the second-warmest year on record.

All told, 10 of the warmest years in their records occurred in the past decade, the NOAA and NASA scientists said.

Since the 1880s, the average global surface temperature has risen about 2 degrees F (1 degree C), according to scientists at NASA's Goddard Institute.

Much scientific work attributes rising temperatures to greenhouse gases such as carbon dioxide, methane and nitrous oxide from fossil fuel

emissions, agriculture and cement production, and land use changes, though some question the connections. Satellite studies of solar energy output since 1978 show the sun doesn't appear to be responsible for the warming trend observed over the past several decades, NASA scientists have reported.

Atmospheric carbon-dioxide levels increased in 2019, reaching a seasonal peak of 414.7 parts per million (ppm) at NOAA's Mauna Loa Atmospheric Baseline Observatory.

It was the seventh consecutive year of global increases in concentrations of carbon dioxide, according to data published by NOAA and Scripps Institution of Oceanography.

The warmest year to date was 2016, when an unusually strong El Niño current in the Pacific Ocean boosted warming world-wide by influencing the formation of high- and low-pressure weather systems, trade winds and rainfall. In 2019, a relatively weak El Niño subsided early, the NASA and NOAA scientists said.

Ocean heat during 2019 was the highest on record, NOAA scientists said.

Weather dynamics often affect regional temperatures differently, so not every area on Earth experienced the same temperatures last year.

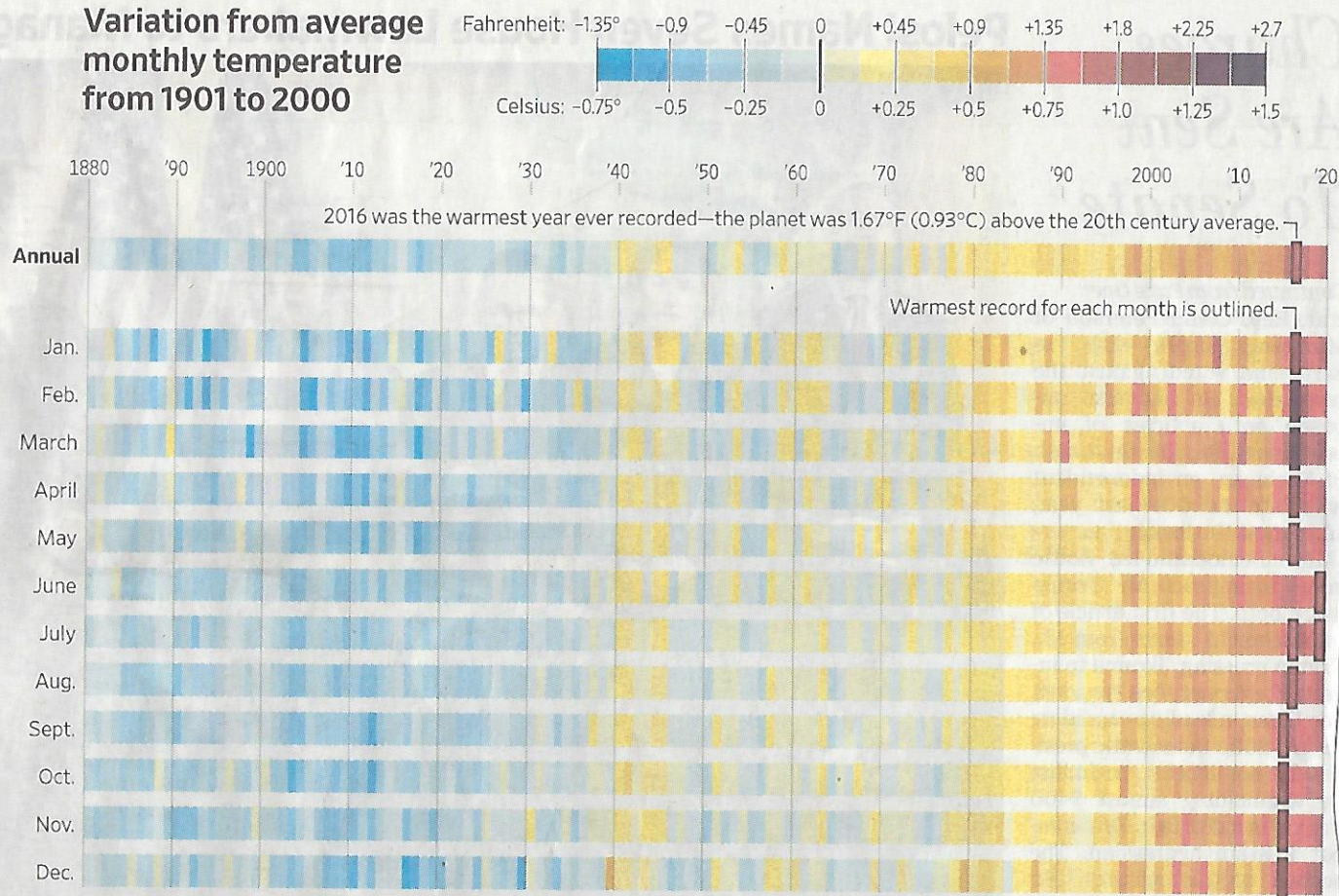
In 2019, Europe recorded its warmest calendar year, experiencing two of the most intense heat waves in its modern history in June and July, according to the Copernicus Climate Change Service, which provides climate analytics to EU member countries. Paris

registered a high temperature of 108.7 degrees F (42.6 C) in July, breaking a 72-year-old record by 4 degrees F.

For the entire U.S., NOAA scientists found the annual mean temperature for 2019 was the third-warmest on record.

Alaska experienced destructive wildfires that, with those in California, caused damages in excess of \$1 billion, NOAA scientists said. In all, NOAA counted 14 weather-related billion-dollar disasters in the U.S. last year.

## Variation from average monthly temperature from 1901 to 2000



Source: NOAA National Centers for Environmental Information

Vivien Ngo/THE WALL STREET JOURNAL