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5 charts that show the severity of climate change

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By a host of measures that climatologists keep a close eye on, 2016 is poised to be one of the most worrisome years ever observed.

By **Matt Rocheleau**

GLOBE STAFF NOVEMBER 22, 2016

The effects of climate change have been particularly pronounced this year.

By a host of measures that climatologists keep a close eye on, 2016 is poised to be one of the most worrisome ever observed. Here are some of the biggest developments:

Record global warmth

This year will very likely go down as the warmest ever recorded, the [World Meteorological Organization](#) said earlier this month.

Through the first 10 months of 2016, global surface temperatures on land, sea, and land and sea combined, were all at record highs, according to data tracked by the [National Oceanic and Atmospheric Administration](#).



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When were the previous records set? In 2015.

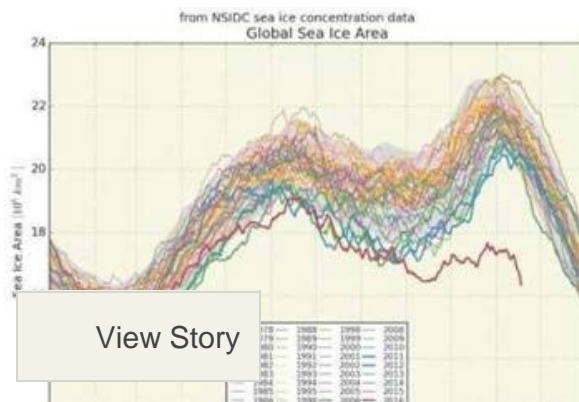


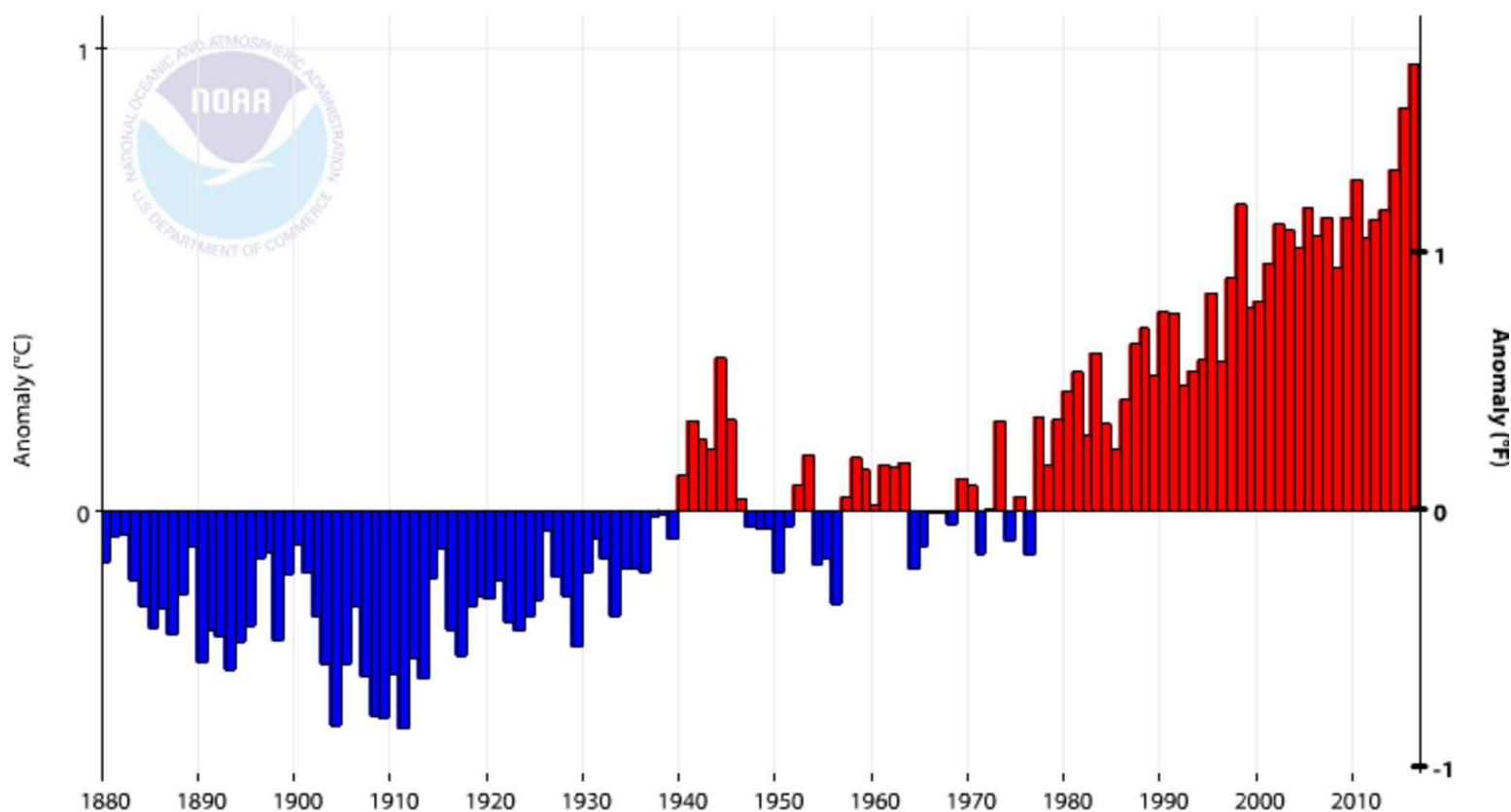
Chart shows decline in sea ice

A chart showing declining ice levels at the planet's poles sent some corners of the Internet into a mild tizzy over the last few days.

South Shore officials to meet on climate change

Land temperatures in 2016 have been 2.66 degrees Fahrenheit above the average for the 20th century; ocean temperatures 1.39 degrees above average; and land and ocean temperatures combined 1.75 degrees above average, according to NOAA.

Global Land and Ocean Temperature Anomalies, January-October



More and more extreme weather

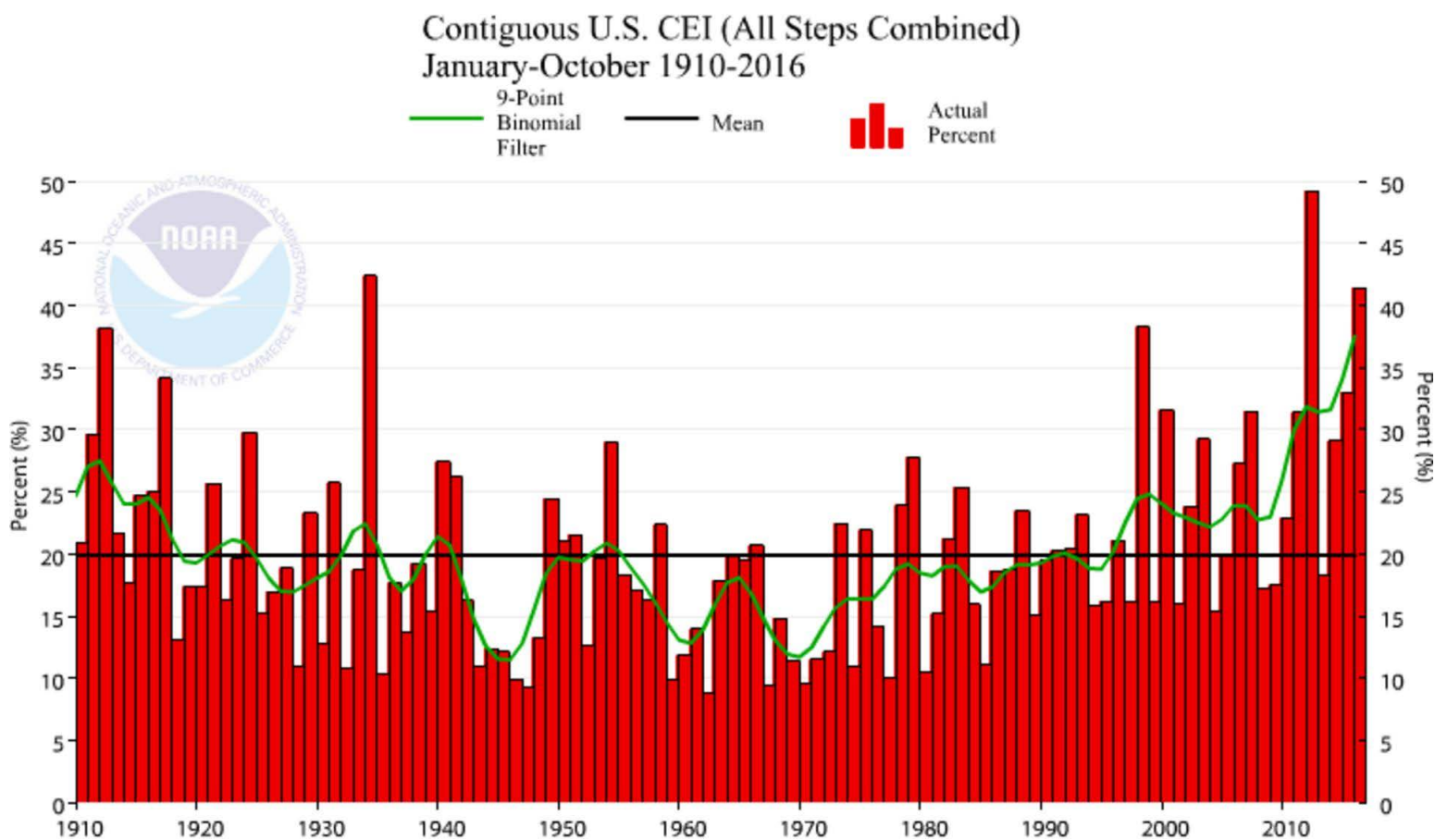
It's not your imagination. [Increasingly extreme weather has been observed in recent years](#) across the United States, records show.

Such weather is one expected result of human-caused global warming.

According to the [U.S. Climate Extremes Index](#), which considers both the frequency of extreme weather and how much land area is affected by such conditions nationwide, the first 10 months of 2016 ranked as the third most-extreme when compared with the same period in other years. The year 2012 holds the record, followed by 1934. Records date back to 1910.



While that index focuses on the US, there have been [signs](#) across the world of increasingly extreme weather.



Sea level rise flooding coastal communities

Scientists in recent years have attributed an increasing number of cases of [coastal flooding](#) to [sea level](#)

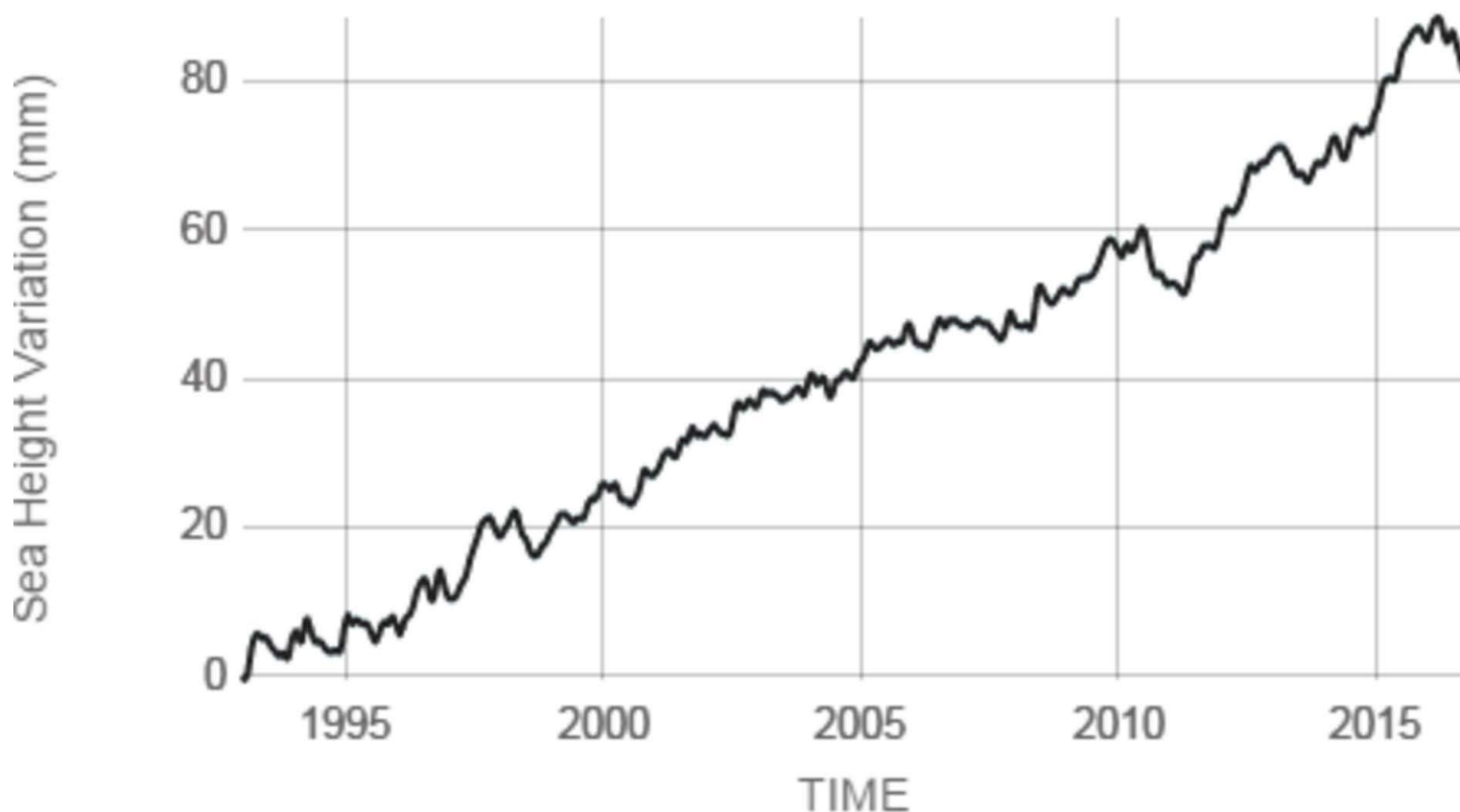
[rise](#) triggered by global warming.

And experts said the flooding from [king tides](#) that coastal communities around the world experienced this year offer a preview of the kind of flooding we can expect to see on a far more frequent basis as oceans continue to rise.

A pair of new studies published this year also highlighted how sea level rise may hit hard in New England.

One of the studies [documented](#) how the world's oceans have risen significantly in recent decades, and at a far faster pace than in preceding centuries. It also said that seas are expected to rise faster in our region than in other parts of the world.

The [other study](#) said the impact of climate change on Boston, including sea level rise, will be far worse than previously thought.



Source: climate.nasa.gov

Sea ice hits record lows

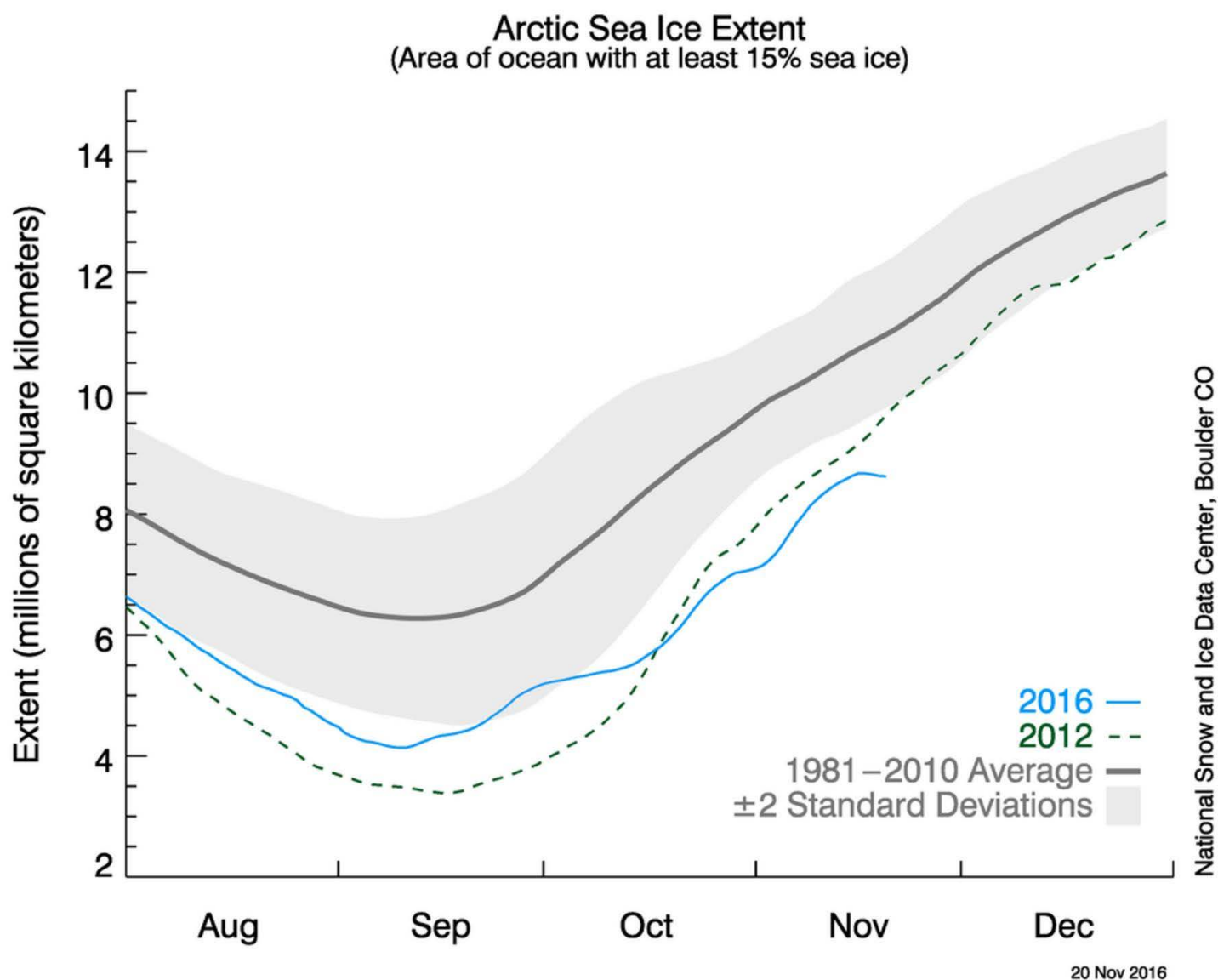
This week, the extent of sea ice surrounding the Arctic and Antarctic regions [were both at record lows](#) for this time of year — marking the first time scientists have simultaneously found record low ice levels at both of the planet's poles.

Scientists say the below-normal sea ice extent in the Arctic is particularly worrisome because it is a strong indication of the effects of climate change, which have persisted in that region for years.

Decreasing the extent of reflective sea ice exposes more dark ocean surface that absorbs sunlight and accelerates warming.

Melting sea ice does not cause sea levels to rise — melting land ice causes that, but [land ice](#) has also been decreasing in recent years.

Thankfully, the recent sudden decrease in sea ice in the Antarctic, while surprising, is not as worrisome to experts, in part because it is believed to have been caused more by short-term weather conditions than global warming.



Greenhouse gas concentrations hit record highs

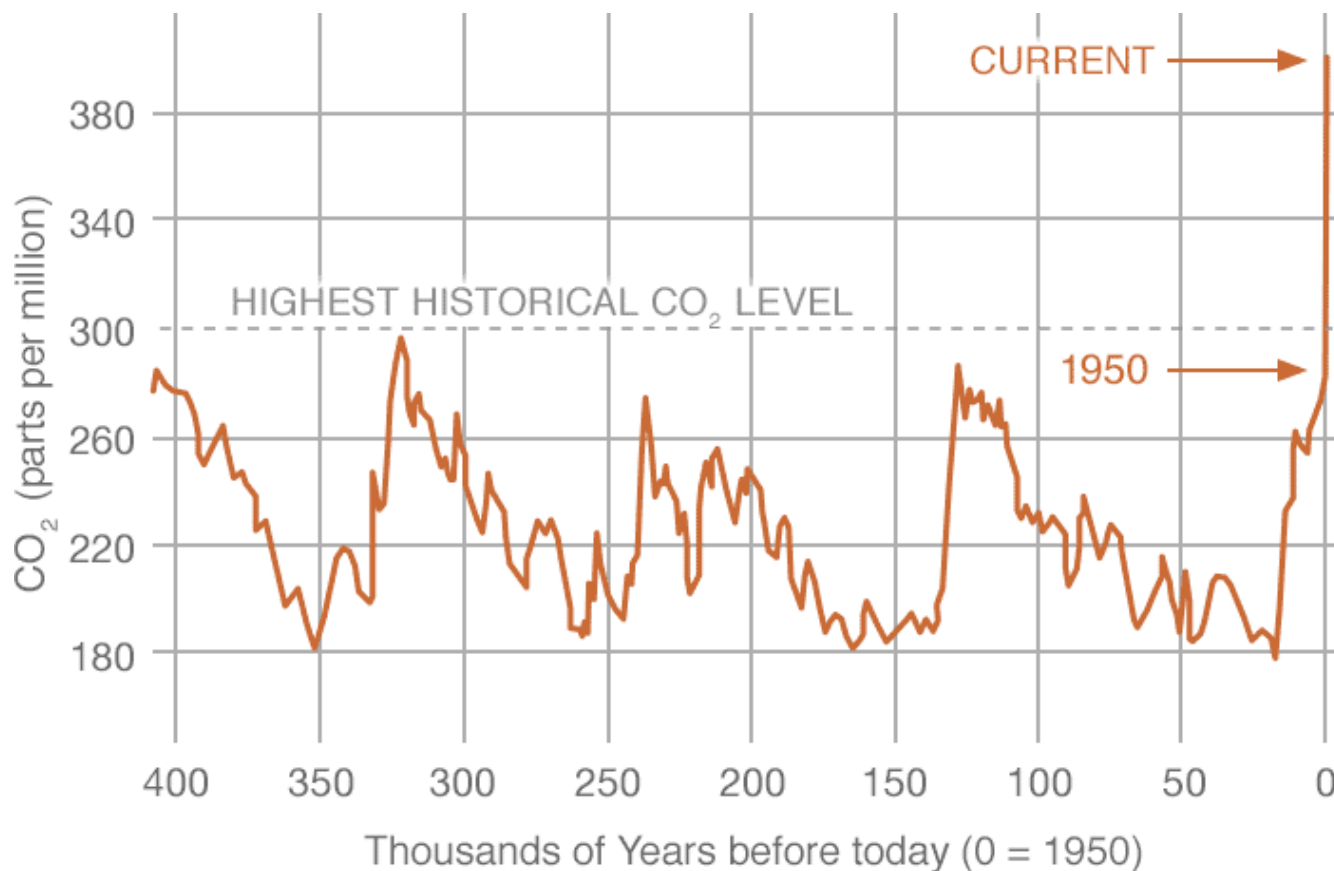
Scientists say greenhouse gas emissions are driving the record warmth that's been causing more extreme weather, rising seas, and melting ice.

Concentration of carbon dioxide in the planet's atmosphere averaged a record-high 400 parts per million in 2015, according to the World Meteorological Organization.

CO2 levels had previously reached the 400 ppm threshold for certain months of the year and in certain locations, but never before on a worldwide average basis for an entire year.

Conditions appear to have [worsened](#) this year.

The organization [said recently](#) it predicts CO₂ concentrations will stay above 400 ppm for all of 2016, and, because CO₂ remains in the atmosphere for thousands of years, it may not dip back below the 400 ppm threshold level “for many generations.”



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