

# Global temperatures are close to 11,000-year peak

Planet is set to get hotter than at any time since last ice age by end of century.

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Global average temperatures are now higher than they have been for about 75% of the past 11,300 years, a study suggests. And if climate models are any indication, by the end of this century they will be the highest ever since the end of the most recent ice age.

Instrumental records of climate extend back to only the late nineteenth century. Beyond that, scientists depend on analyses of natural chronicles such as tree rings and isotope ratios in cave formations.

But even these archives have their limits: many [detailed reconstructions of climate](#), particularly of temperature, apply to only limited regions or extend back at most a couple of millennia, says Shaun Marcott, a climate scientist at Oregon State University in Corvallis.

Marcott and his colleagues set about reconstructing global climate trends all the way back to 11,300 years ago, when the Northern Hemisphere was emerging from the most recent ice age. To do so, they collected and analysed data gathered by other teams. The 73 overlapping climate records that they considered included sediment cores drilled from lake bottoms and sea floors around the world, along with a handful of ice cores collected in Antarctica and Greenland.

Each of these chronicles spanned at least 6,500 years, and each included a millennium-long baseline period beginning in the middle of the post-ice-age period at 3550 bc.

For some records, the researchers inferred past temperatures from the ratio of magnesium and calcium ions in the shells of microscopic creatures that had died and dropped to the ocean floor; for others, they measured the lengths of long-chain organic molecules called alkenones that were trapped in the sediments.

After the ice age, they found, global average temperatures rose until they reached a plateau between 7550 and 3550 bc. Then a long-term cooling trend set in, reaching its lowest temperature extreme between ad 1450 and 1850.

Since then, temperatures have been increasing at a dramatic clip: from the first decade of the twentieth century to now, global average temperatures rose from near their coldest point since the ice age to nearly their warmest, Marcott and his team report today in *Science*<sup>1</sup>.

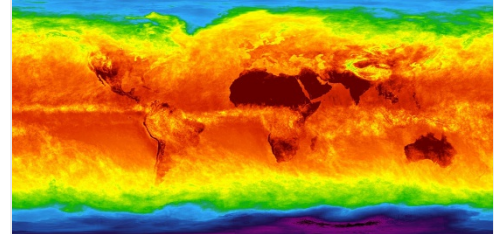
## Climate context

The temperature trends that the team identified for the past 2,000 years are statistically indistinguishable from results obtained by other researchers in a previous study<sup>2</sup>, says Marcott. "That gives us confidence that the rest of our record is right too," he adds.

Marcott and his colleagues "have put together a pretty impressive set of climate proxies", says Gavin Schmidt, a climate scientist at the NASA Goddard Institute for Space Studies in New York. "The overall climate picture has been clear for a long time, mostly from the Northern Hemisphere, but this compilation really puts the rest of the world in context," he adds.

"Prior to this study, researchers could only guess whether global temperatures had exceeded the warmest part of the present interglacial period," says Darrell Kaufman, a geologist at Northern Arizona University in Flagstaff. The latest findings show that the recent high temperatures are not necessarily the warmest, but they are unusually high, he notes.

The temperature trends during most of the post-ice-age period match those expected from natural factors such as the long-term variation in the tilt of Earth's axis, says Marcott. But in the past century and a half, industrial emissions of the greenhouse gas carbon



*Image courtesy AIRS Science Team, NASA/JPL*

Earth's temperatures (here seen by an infrared sensor on the NASA satellite Aqua) are on course to be as hot as at any time since the last ice age.

dioxide have increased — which helps to explain why global temperatures have risen so quickly in recent decades, he suggests.

Climate models from the Intergovernmental Panel on Climate Change suggest that by the end of this century, regardless of future carbon dioxide emissions, temperatures will be at their highest since the end of the most recent ice age, the researchers say.

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## References

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1. Marcott, S. A., Shakun, J. D., Clark, P. U. & Mix, A. C. *Science* **339**, 1198–1201 (2013).
2. Mann, M. E. *et al. Proc. Natl Acad. Sci. USA* **105**, 13252–13257 (2008).