

Greenhouse Earth: Methane powered runaway global warming

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PARIS (AFP) — Methane released from wetlands turned the Earth into a hothouse 55 million years ago, according to research released Wednesday that could shed light on a worrying aspect of today's climate-change crisis.

Scientists have long sought to understand the triggers for an extraordinary warming episode called the Palaeocene-Eocene Thermal Maximum (PETM), which occurred about 10 million years after the twilight of the dinosaurs.

Earth's surface warmed by at least five degrees Celsius (nine degrees Fahrenheit) in just a few hundred or a few thousand years. The Arctic Ocean was at 23 degrees Celsius (73 degrees Fahrenheit) -- about the same as a tepid bath -- before the planet eventually cooled.

Richard Pancost, a researcher at Britain's University of Bristol, seized an opportunity to dig, literally, into this mystery. Excavation of a site in southeast England to set down the Channel Tunnel rail link exposed layers of sediment from a bog that had existed at the time of the PETM. Pancost's team sifted through the dirt to measure the carbon isotope values of hopanoids, which are compounds made by bacteria.

They found that levels of these isotopes suddenly fell at the onset of the PETM, yielding a signature that can only be explained if the bugs dramatically switched to a diet of methane, a powerful, naturally-occurring greenhouse gas. Reporting in the British journal *Nature*, Pancost believes that the methane had remained locked up in the soil for millions of years before warming released it into the atmosphere.

As atmospheric methane levels rose, so too did Earth's temperature as a result of the famous "greenhouse" effect. In turn, that released more methane, and so on.



NASA handout image from 2004 shows Earth rising over the Moon. Methane released from wetlands turned the Earth into a hothouse 55 million years ago, according to research released Wednesday that could shed light on a worrying aspect of today's climate-change crisis.

In other words, it was a vicious circle (a "positive feedback" in scientific parlance), in which warming beget warming.

The study has relevance because of the gigatonnes of methane locked in the Siberian permafrost today.

With the permafrost slowly retreating as a result of global warming, some experts fear a threshold whereby this huge stock of greenhouse gas may also be released, unleashing unstoppable climate change.

But the temperature at which this could happen is unknown and the mechanisms by which the methane is released are unclear.

Co-author Andrew Scott of Royal Holloway University of London is cautious about making parallels. He said the onset to the PETM was far warmer than today, which makes it risky to compare then with now, especially as the data for the new paper comes from just a single site. However, "this does provide insight into how some ecosystems would respond to warming-induced changes in climate, and, therefore how they could respond to warming in the future," said Scott.

A study published last April in the US journal *Science* attributed the methane to a tectonic rather than biological source -- massive volcanic eruptions in Greenland and the British Islands.

Other hypotheses include "belches" of methane released from ice-bound bubbles in sea-floor sediment.

Pancost, though, believes that a volcanic source provided the initial heat trigger that unlocked some methane stocks in the soil and thus launched the positive feedback. He argues that the microbes' sudden switch to methane for their diet indicates they were swamped by a local source of the gas. The explanation for this is a snap release from terrestrial sources, rather than a longer release of methane from the sea or underground, according to Pancost.

Fossil and sedimentary records show that, by the time the PETM was over, around 100,000 years later, many species of fundamental life in the sea had been wiped out and there had been a ruthless culling among mammalian species on land, opening the way to the biodiversity we see today.