

Evidence from warm past confirms recent IPCC estimates of climate sensitivity

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A composite image of the Western hemisphere of the Earth. Credit: NASA



New evidence showing the level of atmospheric CO2 millions of years ago supports recent climate change predications from the Intergovernmental Panel on Climate Change (IPCC).

A multinational research team, led by scientists at the University of Southampton, has analysed new records showing the CO2 content of the Earth's atmosphere between 2.3 to 3.3 million years ago, over the Pliocene.

During the Pliocene, the Earth was around 2°C warmer than it is today and atmospheric CO2 levels were around 350-400 parts per million (ppm), similar to the levels reached in recent years.

By studying the relationship between CO2 levels and <u>climate change</u> during a warmer period in Earth's history, the scientists have been able to estimate how the climate will respond to increasing levels of carbon dioxide, a parameter known as 'climate sensitivity'.

The findings, which have been published in *Nature*, also show how climate sensitivity can vary over the long term.

"Today the Earth is still adjusting to the recent rapid rise of CO2 caused by human activities, whereas the longer-term Pliocene records document the full response of CO2-related warming," says Southampton's Dr Gavin Foster, co-author of the study.

"Our estimates of climate sensitivity lie well within the range of 1.5 to 4.5°C increase per CO2 doubling summarised in the latest IPCC report. This suggests that the research community has a sound understanding of what the climate will be like as we move toward a Pliocene-like warmer future caused by human greenhouse gas emissions."

Lead author of the study, Dr Miguel Martínez-Botí, also from



Southampton said: "Our new records also reveal an important change at around 2.8 million years ago, when levels rapidly dropped to values of about 280 ppm, similar to those seen before the industrial revolution. This caused a dramatic global cooling that initiated the ice-age cycles that have dominated Earth's climate ever since."

The research team also assessed whether <u>climate sensitivity</u> was different in warmer times, like the Pliocene, than in colder times, like the glacial cycles of the last 800,000 years.

Professor Eelco Rohling of The Australian National University in Canberra says: "We find that climate change in response to CO2 change in the warmer period was around half that of the colder period. We determine that this difference is driven by the growth and retreat of large continental ice sheets that are present in the cold ice-age climates; these ice sheets reflect a lot of sunlight and their growth consequently amplifies the impact of CO2 changes."

Professor Richard Pancost from the University of Bristol Cabot Institute, added: "When we account for the influence of the ice sheets, we confirm that the Earth's climate changed with a similar sensitivity to overall forcing during both warmer and colder climates."

More information: Plio-Pleistocene climate sensitivity from a new high-resolution CO2 record, *Nature*, <u>DOI: 10.1038/nature14145</u>

Provided by University of Southampton

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