

## Nature's carbon balance confirmed

**Scientists have found new evidence that the Earth's natural feedback mechanism regulated carbon dioxide levels for hundreds of thousands of years.**

But they say humans are now emitting CO<sub>2</sub> so fast that the planet's natural balancing mechanism cannot keep up.

The researchers, writing in the journal *Nature Geoscience*, say their findings confirm a long-believed theory.

Carbon spewed out by volcanoes is removed from the air by rock weathering and transported to the ocean floor.

Using evidence from an Antarctic ice core, the team calculated that over a period of 610,000 years the long-term change in atmospheric CO<sub>2</sub> concentration was just 22 parts per million (ppm), although there were larger fluctuations associated with the transitions between glacial and interglacial conditions.

**This suggests a natural thermostat which helps maintain climate stability**

Richard Zeebe

By comparison, two centuries of human industry have raised levels by about 100 ppm - a speed of rise about 14,000 times faster.

"These long term cycles are way too slow to protect us from the effect of (anthropogenic) greenhouse gases," said Richard Zeebe from the University of Hawaii in Honolulu.

"They will not help us with our current CO<sub>2</sub> problem. Right now, we have put the system entirely out of equilibrium."

### Deep level

Scientists have long believed that the Earth's climate was stabilised by a natural carbon thermostat.

In their model, carbon released into the atmosphere, primarily by volcanoes, is slowly removed through the weathering of mountains, washed downhill into oceans, and finally buried in deep sea sediments.

"A lot of people had tried to refute this hypothesis, but our study provides the first direct evidence (that it is correct)," said Dr Zeebe.

He studied levels of CO<sub>2</sub> recorded in air bubbles trapped in a 3km ice core drilled from an Antarctic region called Dome Concordia (Dome C).

Data from the ice core, drilled by the European Project for Ice Coring in Antarctica (Epica), was first published in 2005.

But rather than focusing on the peaks and troughs of CO<sub>2</sub> - as other researchers have done - this group looked at the long term trend, and compared the ice core data with records of carbonate saturation in the deep sea for the last six glacial cycles.

"It is remarkable how exact the balance is between the carbon input from volcanoes and the output from rock weathering," said Dr Zeebe.

"This suggests a natural thermostat which helps maintain climate stability."

The delicately balanced carbon thermostat has been a key factor in allowing liquid water, and life, to remain on Earth, he said.

"If it weren't for these feedbacks, the Earth would look very different today."

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