Grim Discovery of Greenhouse Gases

Dr Paul Fraser with air samples collected at Cape Grim. New greenhouse gases have been detected in these samples. North Sullivan

The greenhouse gases NF_3 and SO_2F_2 have been detected in the clean air of Cape Grim on Tasmania's north-west tip. Both are manufactured gases with a global warming potential many times that of carbon dioxide. While the concentrations of each are currently low, they are rising fast, necessitating a rewrite of the Kyoto Protocol.

Dr Paul Fraser of CSIRO Marine and Atmospheric Research says that he and colleagues went looking for NF_3 knowing that it was being used as a replacement for PFCs in the electronics industry. PFCs are extreme greenhouse gases, and reporting of their use is required under the Kyoto Protocol. Unfortunately NF_3 is an even more potent warming gas than PFCs, with 18,000 times the warming potential per molecule of carbon dioxide.

"We didn't go looking for SO_2F_2," Fraser says. "That was a discovery. We noticed this gas, found out what it was and then what it was used for."

SO_2F_2 has been introduced as a replacement fumigator for the ozone-depleting methyl bromine. This has made a major contribution to protecting the ozone layer, but unfortunately SO_2F_2 has a greenhouse potency almost 1000 times that of methyl bromine, which is only five times as powerful a warmer as carbon dioxide.

"I suspect that SO_2F_2 won't be brought into the Kyoto Protocol while the search for replacements goes on," Fraser says. The greenhouse consequences are outweighed by the damage methyl bromine was doing to the ozone layer, and no one wants to go back.

On the other hand, Fraser expects that the Kyoto Protocol will be expanded to include NF_3, encouraging an initial return to PFCs while replacements are sought.

Fossilised Bacteria Reveal Ancient Climate Change

Two species of fossilised bacteria found near Wollongong may track the evolutionary changes brought on by climate events 268 million years ago.

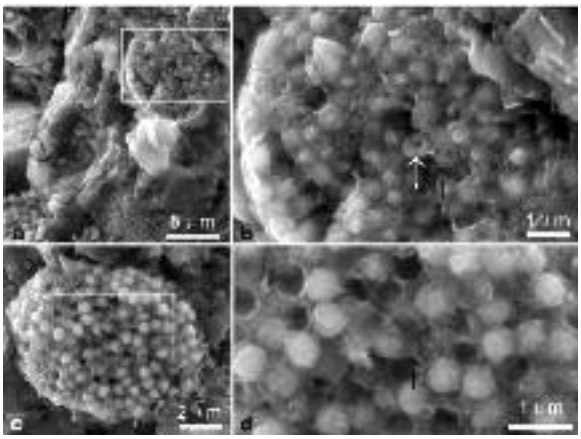
Prof Guang Shi of Deakin University collected a rock while looking for relics of invertebrates on the southern coast of NSW. After polishing, a scanning electron microscope revealed traces of bacterial colonies. "The fossilised bacteria colony looks like a bunch of grapes at microscopic level inside the trace fossil," Shi says.

Closer examination revealed different species in successive layers of rock. "This is the first report from Australia of this kind of fossilised bacteria of this age," Shi says.

Shi believes that both species lived in symbiosis with a burrowing animal that made the formations. The animal is suspected of acting like a gardener, cultivating the bacterial species best suited to the environmental conditions of the time as climate conditions fluctuated.

"The alternating arrangement of the different layers of sediment containing different bacteria fossils could represent a response of the animal to warm and cold climate changes," Shi says.

"We know the climate was oscillating at that time during a global climate transition from an icehouse to a greenhouse state, and the rhythmic climatic oscillations are indeed reflected in both sediment type and animal behaviour living in the ancient environment."



These fossilised bacteria are layered with two alternating species, possibly indicating climate change 268 million years ago.