News release

Museum of Natural History
University of Oxford

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A lesson from the past: Greenhouse gas release caused 40°C ocean

A rapid rise in greenhouse gases around 56 million years ago resulted in sea surface temperatures as high as 40°C with significant impacts on marine life, according to new research published in the September edition of the scientific journal *Geology*.

UK Ocean Acidification Research Programme

The period, known as the Palaeocene-Eocene Thermal Maximum (PETM), lasted for around 170,000 years and saw the release of roughly the same volume of CO_2 as expected from modern fossil fuel consumption.

The research, conducted by Dr Tracy Aze, a research fellow at the Oxford University Museum of Natural History, could have implications for the understanding of climate change in the future.

"The amount of CO_2 that is predicted to be released from the Industrial Revolution to around 100 years from now is roughly equivalent to what happened in the PETM," says Dr Aze. "But the big difference is the rate of release: today we are releasing greenhouse gases at a far faster rate than 56 million years ago. Nonetheless, the PETM shows us that rapid increases in CO_2 in the atmosphere have significant impacts on global temperatures, with the new information from our study site showing that tropical sea surface temperatures may have exceeded 40°C with an associated local disappearance of marine life."

Dr Aze and a team of researchers from universities around the country, led by Professor Paul Pearson of Cardiff University and funded by the UK Ocean Acidification research programme, made use of newly-extracted microscopic marine fossils called planktonic foraminifera. The tiny shells of

these single-celled organisms contain different proportions of oxygen isotopes and these proportions are largely determined by the sea temperatures at the time.

By analysing exceptionally well-preserved PETM fossils from Tanzania, Dr Aze and the research team were able to reconstruct a picture of sea surface temperatures and changes in the abundance of planktonic life.

It is the first time such well-preserved tropical foraminifera specimens have been available for this type of study and they reveal a picture of the effects of a substantial release of greenhouse gases into the atmosphere. By providing a partial analogue for current anthropogenic global warming, this research into the PETM informs the modelling of future climate change patterns.

For further information:

Dr Tracy Aze, Lecturer: Marine Micropaleontology, University of Leeds; tel: 0113 34 35246, email: T.Aze@leeds.ac.uk, http://www.see.leeds.ac.uk/people/t.aze (formerly at Museum of Natural History, University of Oxford)

Dr Phillip Williamson, UKOA Science Coordinator, p.williamson@uea.ac.uk; 07749 092287

Kelvin Boot (Science Communicator) - kelota@pml.ac.uk, 07792 385 158

Plymouth Marine Laboratory Communications Office – comms@pml.ac.uk 01752 633401

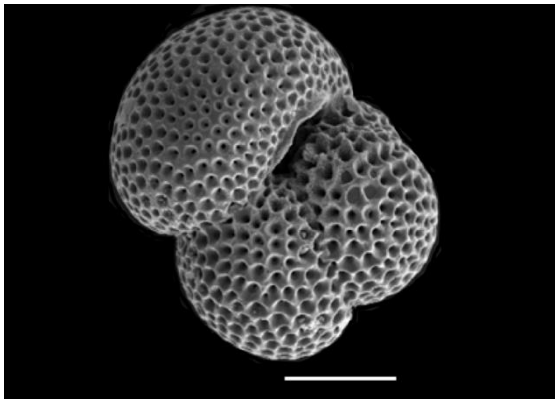
Notes for editors

- The research paper, Extreme warming of tropical waters during the Paleocene–Eocene Thermal Maximum, was published in the September issue of Geology (doi: 10.1130/G35637.1) and co-authored by by Dr T. Aze (Oxford University Museum of Natural History), P.N. Pearson (Cardiff University), A.J. Dickson (Open University), M.P.S. Badger (University of Bristol), P.R. Bown (University College London), R.D. Pancost (University of Bristol), S.J. Gibbs (University of Southampton), B.T. Huber (Smithsonian Institute), M.J. Leng (University of Nottingham), A.L. Coe (Open University), A.S. Cohen (Open University), and G.L. Foster (University of Southampton).

- The Palaeocene-Eocene Thermal Maximum is thought to have started about 55.8 million years ago and lasted for approximately 170,000 years. Its precise causes are not yet fully understood.

- The UK Ocean Acidification research programme (UKOA**;** www.oceanacidification.org.uk) is a £12m, 5 year research programme funded by the Natural Environment Research Council (NERC), the Department for Environment, Food and Rural affairs (Defra) and the Department of Energy and Climate Change (DECC). UKOA outputs feed into the cross-government Climate Change Adaptation programme and the Living with Environmental Change (LWEC) programme. UKOA has many international links and partnerships, including those with the German BIOACID programme; the European research project MedSeA; the US Ocean Acidification Program; the Ocean Acidification International Coordination Centre; and the Convention on Biological Diversity.

Present-day planktonic foraminifera
Photo: GLOW cruise scientists



Well-preserved foraminiferan shell from the Palaeocene-Eocene Thermal Maximum (*Subbotina velascoensis*)