Volcanism drove rapid ocean deoxygenation during the time of the dinosaurs

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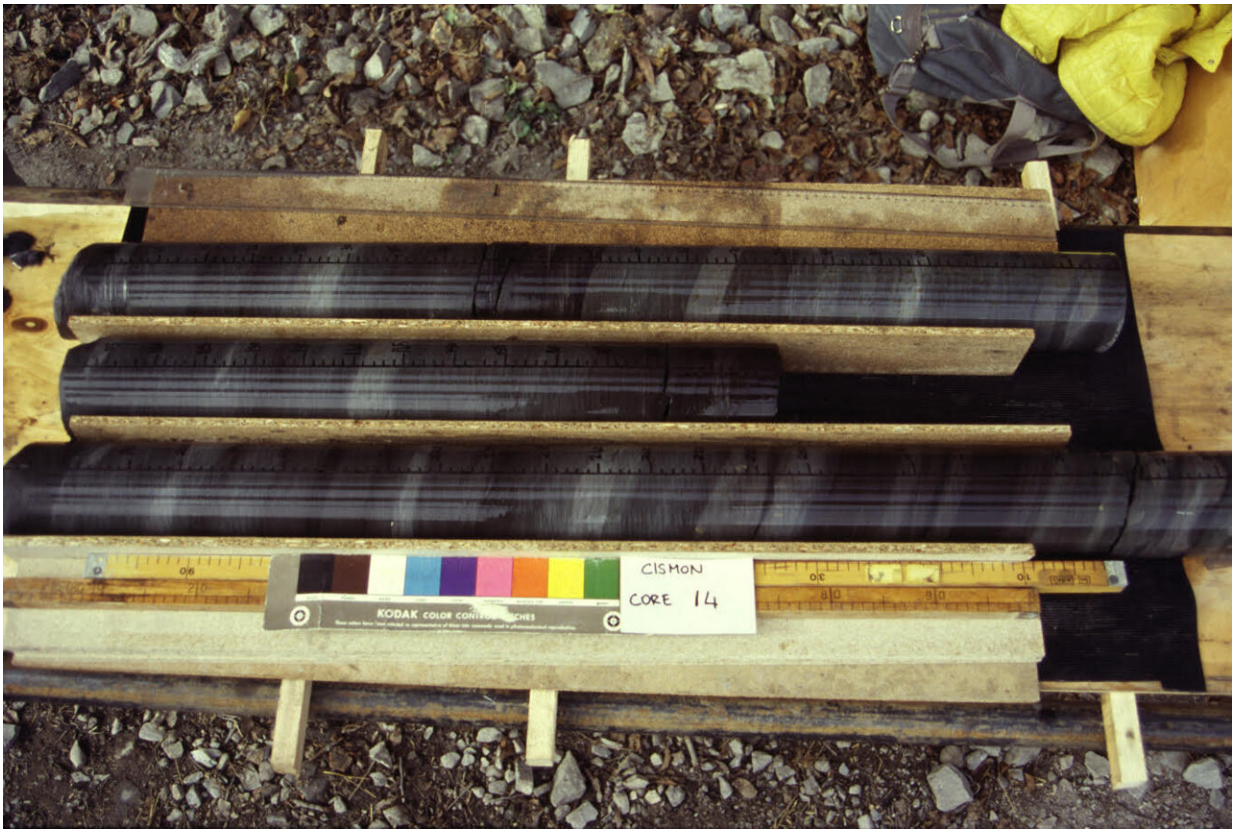

Core samples for Oceanic Anoxic Event 1a. A new study from University of British Columbia and University of Hong Kong indicates volcanism drove rapid ocean deoxygenation during the time of the dinosaurs. Credit: Elisabetta Erba.

Ocean deoxygenation during the Mesozoic Era was much more rapid

than previous thought, with CO_2 induced environmental warming creating ocean 'dead zones' over timescales of only tens of thousands of years.

The research from University of British Columbia (UBC) and University of Hong Kong (HKU) Earth scientists paints a new picture of severe ocean deoxygenation events in our planet's geologic history.

"Physical drivers, in particular ocean warming linked to volcanic activity during the Cretaceous Period, played key roles in triggering and maintaining oceanic anoxia," says lead researcher Dr. Kohen Bauer, who began the work while at UBC and completed the study with HKU's Department of Earth Sciences.

"The same mechanisms are also critically important drivers of modern ocean deoxygenation and expanding marine dead zones. Today, in addition to volcanoes releasing CO_2 into the atmosphere, humans are as well."

Previous research tended to focus on the role ocean nutrient cycles played in causing so called 'dead zones'—a process that would have driven ocean deoxygenation over much longer timescales of hundreds of thousands of years. However, it's now clear that massive volcanism and its associated feedbacks was a more direct trigger for the rapid development of oceanic anoxia.

The research delved into the causes of Oceanic Anoxic Event 1a—an interval 120 million years ago when large swaths of Earth's oceans became anoxic. Those conditions likely persisted for almost a million years, causing climate perturbations, and biotic turnover.

The scientists reconstructed the period's environmental conditions using novel geochemical methods and ancient sediments deposited in both the

paleo-Tethys and paleo-Pacific oceans.

"Mesozoic oceanic anoxic events are some of the most important analogs for unlocking lessons about warm-Earth climate states in the geological record," says UBC's Dr. Sean Crowe, author on the paper and Canada Research Chair in Geomicrobiology with UBC's departments of Microbiology and Immunology, and Earth, Ocean and Atmospheric Sciences.

"These events provide enormous potential to help us better understand the sensitivity of the Earth system to perturbations in global biogeochemical cycles, marine biology, and climate on timescales relevant to humankind."

The paper was published in the journal *Geology*.

More information: Kohen W. Bauer et al, Pulsed volcanism and rapid oceanic deoxygenation during Oceanic Anoxic Event 1a, *Geology* (2021). DOI: 10.1130/G49065.1

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