

Geologists confirm oxygen levels of ancient oceans

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Earth's landscape, as it may have looked more than 2.5 billion years ago. Credit: Peter Sawyer, The Smithsonian Institute

(Phys.org) —Zunli Lu and Xiaoli Zhou, an assistant professor and Ph.D. student, respectively, in the Department of Earth Sciences, are part of an international team of researchers whose findings have been published by the journal *Geology* (Geological Society of America, 2014). Their research approach may have important implications for the study of marine ecology and global warming.

"More than 2.5 billion years ago, there was little to no [oxygen](#) in the

oceans, as methane shrouded the Earth in a haze," says Lu, a member of Syracuse University's Low-Temperature Geochemistry Research Group. "Organisms practicing photosynthesis eventually started to overpower reducing chemical compounds [i.e., electron donors], and oxygen began building up in the atmosphere. This period has been called the Great Oxidation Event."

Using a novel approach called iodine geochemistry, Lu, Zhou and their colleagues have confirmed the earliest appearance of dissolved oxygen in the ocean's surface waters.

Central to their approach is iodate, a form of iodine that exists only in oxygenated waters. When iodate is detected in carbonate rocks in a marine setting, Lu and company are able to measure the elemental ratio of iodine to calcium. This measurement, known as a proxy for ocean chemistry, helps them figure out how much oxygen has dissolved in the water.

"Iodine geochemistry enables us to constrain [oxygen levels](#) in oceans that have produced calcium carbonate minerals and fossils," says Lu, who developed the proxy. "What we've found in ancient rock reinforces the proxy's reliability. Already, we're using the proxy to better understand the consequences of ocean deoxygenation, due to rapid [global warming](#)."

Provided by Syracuse University

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