Scientists uncover miscalculation in geological undersea record

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The precise timing of the origin of life on Earth and the changes in life during the past 4.5 billion years has been a subject of great controversy for the past century. The principal indicator of the amount of organic carbon produced by biological activity traditionally used is the ratio of the less abundant isotope of carbon, 13C, to the more abundant isotope, 12C.

As plants preferentially incorporate 12C, during periods of high production of organic material the 13C/12C ratio of carbonate material becomes elevated. Using this principle, the history of organic material has been interpreted by geologists using the 13C/12C ratio of carbonates and organics, wherever these materials can be sampled and dated.

While this idea appears to be sound over the last 150 million years or so, prior to this time there are no open oceanic sediment records which record the 13C/12C ratio, and therefore, geologists are forced to use materials associated with carbonate platforms or epicontinental seas.

In order to test whether platform-associated sediments are related to the global carbon cycle, a paper by University of Miami Professor Dr. Peter K. Swart appears in the *Proceedings of the National Academy of Sciences*. This paper examines changes over the past 10 million years at sites off the Bahamas (Atlantic Ocean), the Maldives (Indian Ocean), and Great Barrier Reef (Pacific Ocean). The variations in the 13C/12C ratio are synchronous at all of the sites studied, but are unrelated to the global change in the 13C/12C ratio.

It appears that records related to carbonate platforms which are often used throughout the early history of the Earth are not good recorders of the 13C/12C ratio in the open oceans. Hence, the work presented suggests that assumptions made previously about changes in the 13C/12C ratios of carbonate sediments in the geological record are incorrect.

"This study is a major step in terms of rethinking how geologists interpret variations in the 13C/12C ratio throughout Earth's history. If the approach does not work over the past 10 million years, then why would it work during older time periods?" said Swart. "As a consequence of our findings, changes in 13C/12C records need to be reevaluated, conclusions regarding changes in the reservoirs of carbon will have to be reassessed, and some of the widely-held ideas regarding the elevation of CO_2 during specific periods of the Earth's geological history will have to be adjusted."

Source: University of Miami