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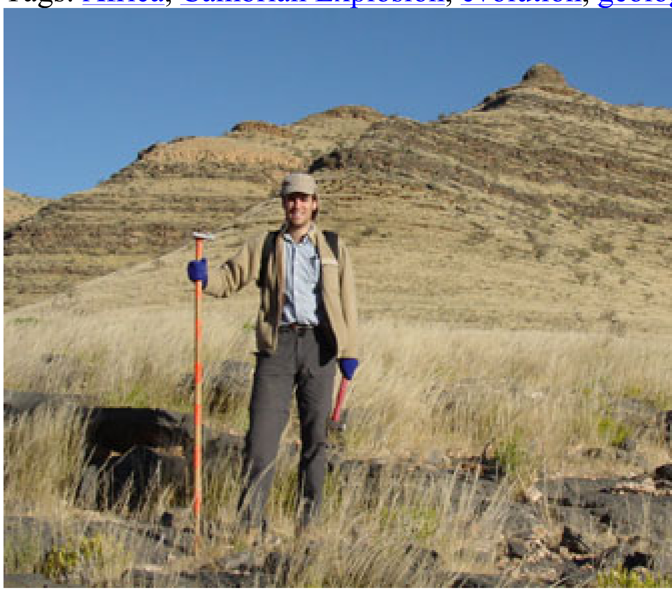
# In African rocks, traces of evolutionary blast

Tags: Africa, Cambrian Explosion, evolution, geology, limestone, oxygen, primordial, sulfate



UNC marine geologist Justin Ries in the Zebra River Valley, southern Namibia. The Nama Group carbonates, which contain sulfur isotopic signatures suggesting that low marine sulfate and low atmospheric oxygen conditions persisted up until the Cambrian Explosion, loom in the background. (Credit: Gordon Love)

**UNC-CHAPEL HILL**—New research has opened the door on what some consider to be the greatest event in the history of animal life: a massive evolutionary jumpstart during the Cambrian Explosion half a billion years ago.

Justin Ries, assistant professor in the department of marine sciences and his colleagues at the University of North Carolina at Chapel Hill, were interested in why, after hundreds of millions of years of only simple animals existing, there seemed to be a burst of activity resulting in thousands of new and more complex life forms.

Several theories have been put forward to explain this delay in diversification—such as the emergence of predators around the time of the Cambrian Explosion, which drove other creatures to develop more sophisticated defenses—but the various reasons remain under debate.

The new findings, published in the August issue of the journal *Geology*, appear to strongly bolster one explanation—that the low oxygen levels of the primordial atmosphere and oceans persisted much longer than previously thought, suggesting it was the alleviation of these low oxygen conditions that ultimately allowed animal life to flourish.

“This period was a game-changer in terms of the evolutionary structure of life,” Ries says. “Our findings are consistent with the idea that it occurred because of major changes in the composition of the ocean and atmosphere at that time.”

Scientists have maintained that relatively high oxygen levels existed on the planet long before the Cambrian period, Ries says, but if that was the case and oxygen was key to the evolutionary event, why did it take until then for the few initial stems of animal life to expand into the thousands of lineages that emerged?

The new research appears to answer that puzzle. The team examined the chemical signature of limestone rocks in southern Namibia, Africa, that were deposited in the oceans between 553 million and 543 million years ago, just before the Cambrian Explosion and found that at that time, sulfate levels in the ancient ocean—and by implication, oxygen levels in the atmosphere—were much lower than previously thought.

Scientists are able to use sulfate—a molecule that is dissolved in seawater—as a proxy for the amount of oxygen that existed, because their respective levels vary in proportion with one another (marine sulfate is primarily derived from the oxidation of terrestrial sulfide).

“This implies that the subsequent alleviation of these low sulfate and low oxygen conditions may have led to the intense diversification of animals in early Cambrian time,” Ries concludes.

Researchers from California Institute of Technology, Indiana University, and the University of California at Riverside contributed to the study.

*UNC-Chapel Hill news: http://uncnews.unc.edu*