Marine methane reservoirs much larger 550 million years ago

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Massive methane reservoirs in the ancient ocean could account for an unexplained hiccup in Earth's carbon cycle.

In the latest issue of the Proceedings of the National Academy of Sciences, Christian J. Bjerrum and Don E. Canfield devised a mathematical model to examine the Shuram-Wonoka anomaly, a planet-wide shift in the chemical composition of marine sediments some 550 million years ago.

During the anomaly, the fraction of isotopically heavy carbon atoms plummeted to levels that violate the currently accepted view of Earth's carbon cycle.

The authors' model attempts to explain the anomaly by assuming that methane reservoirs, some 2 to 30 times larger than those in existence today, erupted into the atmosphere in a geologically rapid, 2-million-year-long hiccup.

Researchers have long known that methane gas becomes trapped in ice-like cages of water molecules that form under the immense pressures and low temperatures of the deep ocean. Some studies have proposed that magma intrusions or sudden drops in sea level can release large reservoirs of the trapped gas into the atmosphere.

According to the authors, the ocean and atmosphere were chemically different at the time of the Shuram-Wonoka anomaly compared with

today and would have been unable to quickly remove a rapid infusion of methane.

Accounting for these differences, the authors report, allows their model to reproduce the unique isotopic signature that characterizes Shuram-Wonoka marine sediments.

More information: "Towards a quantitative understanding of the Late Neoproterozoic carbon cycle," by Christian J. Bjerrum and Don E. Canfield, *Proceedings of the National Academy of Sciences* (2011)

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