Greenhouse gas effect consistent over 420 million years（图）

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[摘要] 28-Mar-2007，New Haven, Conn.New calculations show that sensitivity of Earth's climate to changes in the greenhouse gas carbon dioxide (CO_2) has been consistent for the last 420 million years, according to an article in Nature by geologists at Yale and Wesleyan Universities.

[关键词] carbon dioxide;greenhouse gas

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New Haven, Conn.New calculations show that sensitivity of Earth's climate to changes in the greenhouse gas carbon dioxide (CO_2) has been consistent for the last 420 million years, according to an article in Nature by geologists at Yale and Wesleyan Universities.

A popular predictor of future climate sensitivity is the change in global temperature produced by each doubling of CO_2 in the atmosphere. This study confirms that in the Earth's past 420 million years, each doubling of atmospheric CO_2 translates to an average global temperature increase of about 3?

Celsius, or Fahrenheit.

According to the authors, since there has continuously been life on the planet over this time span, there must be an ongoing balance between CO_2 entering and leaving the atmosphere from the rocks and waters at Earth's surface. Their simulations examined a wide span of possible relationships between atmospheric CO_2 and temperature and the likelihood t

Most estimates of climate sensitivity have been based on computer simulations of climate or records of climate change over the past few decades to thousands of years, when carbon dioxide concentrations and global temperatures were similar to or lower than today. Such estimates could underestimate the magnitude of large climate

-change events. To keep Earth's carbon cycle in balance, atmospheric CO_2 has varied over geologic time. Carbon-

cycle models balance chemical reactions that involve carbon, such as photosynthesis and the formation of limestone, on a global scale. To better predict future trends in global warming, these researchers compared estimates from long

-term modeling of Earth's carbon cycle with the recent proxy measurements of CO_2.

This study used 500 data points in the geological records as "proxy data" and evaluated them in the context of the CO_2 cycling models of co-

author Robert Berner, professor emeritus of geology and geophysics at Yale who pioneered models of the balance of CO_2 in the Earth and Earth's atmosphere.

"Proxy data are indirect measurements of CO_2 ?they are a measure of the effects of CO_2," explained co-

author Jeffrey Park, professor of geology and geophysics at Yale who created the computer simulations for the project. "While we cannot actually measure the CO_2 that was in the atmosphere millions of years ago, we can measure the geologic record of its presence. For example, measurement of carbon isotopes in ancient ocean

-plankton material reflects atmospheric CO_2 concentrations."

Led by Dana L. Royer, assistant professor of Earth and Environmental Sciences at Wesleyan University, who did his graduate work in geology at Yale, the collaboration simulated 10,000 variations in the carbon

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cycle processes such as the sensitivity of plant growth to extra CO_2 in the atmosphere. They evaluated these variations for a range of atmospheric warming conditions, using the agreement with the geologic data to determine the most likely warming scenarios. The model

-estimated atmospheric CO_2 variations were tested against data from ancient rocks.

Other proxy measurements of soil, rock and fossils provided estimates of CO_2 over the past 420 million years. Calculation of the climate sensitivity in this way did not require independent estimates of temperature. It incorporated information from times when the Earth was substantially warmer and colder than today, and reflects the sensitivity of the carbon

-cycle balance over millions of years.