Geologist discovers pattern in Earth's long-term climate record

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This is Lorraine Lisiecki from University of California, Santa Barbara. Credit: UCSB

In an analysis of the past 1.2 million years, UC Santa Barbara geologist Lorraine Lisiecki discovered a pattern that connects the regular changes of the Earth's orbital cycle to changes in the Earth's climate. The finding is reported in this week's issue of the scientific journal *Nature Geoscience*.

Lisiecki performed her analysis of climate by examining ocean sediment cores. These cores come from 57 locations around the world. By analyzing sediments, scientists are able to chart the Earth's climate for millions of years in the past. Lisiecki's contribution is the linking of the climate record to the history of the Earth's orbit.

It is known that the Earth's orbit around the sun changes shape every 100,000 years. The orbit becomes either more round or more elliptical at these intervals. The shape of the orbit is known as its "eccentricity." A related aspect is the 41,000-year cycle in the tilt of the Earth's axis.

Glaciation of the Earth also occurs every 100,000 years. Lisiecki found that the timing of changes in climate and eccentricity coincided. "The clear correlation between the timing of the change in orbit and the change in the Earth's climate is strong evidence of a link between the two," said Lisiecki. "It is unlikely that these events would not be related to one another."

Besides finding a link between change in the shape of the orbit and the onset of glaciation, Lisiecki found a surprising correlation. She discovered that the largest glacial cycles occurred during the weakest changes in the eccentricity of Earth's orbit -- and vice versa. She found that the stronger changes in the Earth's orbit correlated to weaker changes in climate. "This may mean that the Earth's climate has internal instability in addition to sensitivity to changes in the orbit," said Lisiecki.

She concludes that the pattern of climate change over the past million years likely involves complicated interactions between different parts of the climate system, as well as three different orbital systems. The first two orbital systems are the orbit's eccentricity, and tilt. The third is "precession," or a change in the orientation of the rotation axis.

Provided by University of California - Santa Barbara