

New research suggests Sierra Nevadas older than previously thought

January 11 2010, By Amina Khan

The Sierra Nevada mountain range reached its present height 50 million years ago -- 30 million years earlier than geologists once believed, according to a new study.

The research adds to a growing body of evidence that the Sierra Nevadas are far older than once thought and has implications for the evolution of the plants and animals in the West, as well as for the likely climate of ancient North America.

The study, by scientists at Yale University and the Berkeley Museum of Paleontology, used 50-million-year-old chemical traces left by microbes and rain droplets that fell onto ancient leaves to calculate the new height estimate for the Sierras at that time.

The western United States would have looked very different back then, filled with lush forests of vines and magnolias. The Pacific Ocean would have lapped the foot of the Sierras.

"This is a time period where there would have been crocodiles in Wyoming," said Michael Hren, lead author and a University of Michigan postdoctoral fellow who did the research while at Yale.

Sampling sites of ancient flood plains, the researchers found leaves still preserved in the oxygen-poor sediments. They analyzed the waxes produced on the surface of those ancient leaves, measuring levels of normal hydrogen and its slightly heavier isotope, [deuterium](#), in the

waxes. This gave them an estimate of the elevation at which the leaves grew.

As clouds rise up the side of mountains, water droplets containing the heavier isotope fall from them first, and droplets containing the lighter hydrogen, later. Thus, the lower the proportion of deuterium in waxes, the higher up the [mountain](#) that leaf must have been, the scientists surmised.

Hren also looked at soil carried down from the mountains to the ancient floodplains, checking for chemicals left by microbes that lived in the sediments millions of years ago. These microorganisms changed the composition of their cell membranes depending on whether it was cool or hot -- providing a kind of ancient biological thermometer.

Using those data, the scientists estimated that the temperature there had been 6-8 degrees Celsius warmer than today.

The idea that the [Sierra Nevada](#) mountains were sitting at their current height 30 million years earlier than anticipated has implications for studies on the evolution of plants and animals, scientists said.

For example, with the mountains already in place so long ago, "how could animals migrate from California into the Great Basin?" said Paul Koch, chair of the Earth and Planetary Sciences Department at the University of California-Santa Cruz, who was not involved in the research. For understanding evolution of U.S. flora and fauna, "it matters a lot," he said.

The finding also has implications for historical climate estimates across North America. "Climate models require that you understand elevation. In Kansas it matters for you to get the topography of the [Sierra Nevada](#) right. In Florida it matters," Koch said.

The work, which was published in the journal *Geology*, also provides a more accurate tool for exploring the elevation of ancient landscapes, said Diane M. Erwin, a study co-author from the UC Berkeley Museum of Paleontology. In the past, such estimates have been made by studying leaf shapes. Such estimates can be less accurate than the deuterium method.

Putting together different pieces of data to create a coherent picture of the past is what drew him to the work, Hren said. "It's amazing to break open a rock and look at these amazingly preserved leaves that can tell you a story from 50 million years ago."

(c) 2010, Los Angeles Times.

Distributed by McClatchy-Tribune Information Services.

Citation: New research suggests Sierra Nevadas older than previously thought (2010, January 11) retrieved 23 April 2024 from

<https://phys.org/news/2010-01-sierra-nevadas-older-previously-thought.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--