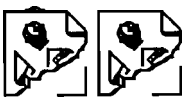
UA Science & Research News

October 14, 1998

Life flourished when Earth was warmer, scientist says



Melanie Lenart

Contact(s):

Judith Totman Parrish
520-621-4595
parrish@.aeo.arizona.edu

The threat of a global warming doesn't scare Judith Parrish, a geologist at The University of Arizona in Tucson and an expert on ancient climates.

She's seen the ghost of the distant past in fossil leaves from the mid-Cretaceous, about 100 million years ago. These long-dead leaves tell tales of a warmer climate, when forests grew in the now-barren polar regions.

"Life flourished when the climate was warmer," said Parrish, UA professor of geosciences. Her book, "Interpreting Pre-Quaternary Climate from the Geologic Record," is being released this month. The Quaternary represents roughly the last 2 million years, a time of recurring ice ages when continental glaciers sometimes stretched as far south as Illinois.

"The last 2 million years don't have anywhere near the full range of climate history," Parrish emphasized. "The lack of ice during the Cretaceous is typical. Having the great big ice caps is not typical."

The Cretaceous describes the period 113 million to 65 million years ago, when dinosaurs roamed the planet. Geological evidence indicates that during the Cretaceous, as during much of the Earth's history, the planet was much warmer than it is today -- and generally warmer than it is projected to be in the next few centuries as the result of a buildup in greenhouse gases.

Some of that evidence comes from Parrish's own research, including a paper she recently wrote with colleagues on the vegetation found near the South Pole during the mid-Cretaceous. The team of researchers traveled to locations in New Zealand to examine sediments and fossils deposited during the mid-Cretaceous, using methods they had developed for a previous project in Alaska.

When the fossils were deposited in what are now New Zealand and Alaska, the land masses under scrutiny were both located at latitudes of between 70 and 85 degrees -- within the polar circles that are shrouded in continuous darkness for several months every year. Latitudinal lines run from the middle of the planet to its tip, starting at 0 degrees around the equator and continuing to 90 degrees North and South at each pole.

Yet despite the darkness and polar location, the fossils indicated that the lands in question supported a thriving forest during the mid-Cretaceous. Parrish and her colleagues believe the forests resembled modern-day forests of western Oregon, with a canopy of cone-bearing trees shading an understory of ferns and horsetails.

Unlike modern pine trees, though, the Cretaceous conifers apparently shed their leaves every year. Present-day Oregon forests thrive at 45 degrees North but fade into a different forest type by about 50 degrees North.

"By the time you get up to British Columbia, the diversity of the understory has dropped," Parrish said. The boreal forest, which ranges up to about 70 degrees North, has much smaller trees and fewer species, she noted. "By that time, they're scrawny little things. It's generous to call them trees."

The size of local plant life tends to increase with warmer temperatures, given enough water for ample growth. But the shape of the leaves yields even more information for researchers looking for clues on past climates. In fact, Jack A. Wolfe, a scientist based at the UA Desert Laboratory on Tumamoc Hill in Tucson, developed a successful method for estimating annual average temperature of a region by comparing leaf shapes of local plants.

Parrish and her colleagues applied Wolfe's technique to their polar forests. The results? They estimated that the average annual temperature around the poles during the mid-Cretaceous was about 10 degrees Celsius, or roughly 50 degrees Fahrenheit.

Yet the warmer poles did not necessarily mean hotter tropical climates, as Parrish points out. Other researchers have found evidence for relatively stable temperatures in the lower latitudes around the equator when comparing the Cretaceous to modern times.

"When you have global change, the action is in the higher latitudes," Parrish explained. Computer models today predict most of the 2 to 7 degree Fahrenheit warming expected over the next century will also be centered on the poles rather than tropical regions.

There is at least one consequence of a future warming that could adversely affect many people, however: Sea level is expected to rise by as much as 3 feet over the next century as water trapped in continental ice melts into the ocean and inundates coastal cities.

"It's more a social problem than anything else," Parrish said of the perceived threat of global warming. "It's just that 80 percent of the population has chosen to live near coastal areas."

****

More information about UA science and research
is available at the News Services WWW site:
http://science.opi.arizona.edu
****

Links:
http://www.aeo.arizona.edu/