

The Department of Earth & Environmental Sciences, through the support of the College of Science and Mathematics, presents:

Determining river downcutting rates in the southern Sierra Nevada, California, using cosmogenic dating of cave sediments

Greg Stock, Ph.D.
Geologist
Resources Management and Science
Yosemite National Park

Date and Time: 6:00 PM Thursday, October 12, 2006

Location: CSU Fresno Music Room 160
(Reception 6:00 PM—Lecture 6:15 PM)

Abstract

The geologic history of the Sierra Nevada continues to be an area of active research, with considerable debate regarding whether or not the range experienced substantial uplift in the last 10 million years. Caves and cave deposits along the Kings and Kaweah rivers provide new rates of river downcutting, which are relating to mountain uplift. In the southern Sierra Nevada, numerous caves adorn the walls of deep canyons cut into marble bedrock. These caves represent former river levels etched into the bedrock. Using a new dating technique, we determined burial ages for granitic sediments washed into caves that were once at river level and are now perched high in canyon walls. We find that relatively rapid downcutting of 0.2 mm/yr from 2.7 to 1.5 million years ago slowed markedly to 0.02 mm/yr thereafter. Modeling of river profiles indicates that the slower rate of downcutting is likely due to a transient response to rock uplift 3-5 million years ago; in the model, westward tilting of the range initiates a pulse of accelerated erosion that begins at the edge of the Central Valley and propagates up the river profile, passing the caves between 5 and 2 million years ago. Downcutting rates decline markedly after this time. Downcutting after 2 million years ago may have been further reduced by periodic mantling of riverbeds with glacially derived sediment. The caves also demonstrate that while 400 m of downcutting has occurred in the last 2-3 million years, canyons up to 1600 m deep existed prior to that time. Thus, uplift and erosion of the Sierra Nevada between 3 to 5 million years ago enhanced substantial pre-existing topography.

This program is open to everyone. It is sponsored by the Department of Earth and Environmental Sciences with a grant from the College of Science and Mathematics. For additional information, please contact the Earth & Environmental Sciences Department office in Science II Room 114 or call (559) 278-3086 or email kworkman@csufresno.edu

Free parking in Lots C & V (at Shaw and Maple Avenues) between 4:30 and 7:30 PM for seminar participants. An online campus parking map is located at: <http://www.csufresno.edu/univrelations/map/Default.html>.