

# Sierra mountain range on the rise

If it seems like the Sierra are getting taller, it's because they are.

Depletion of groundwater is causing the Sierra Nevada mountains to rise, according to a study published in the journal *Nature* on May 14.

"We first wrote two years ago about the rapid rise of the Sierra, with its 14,000-foot peaks in the south and 10,000-foot peaks at Lake Tahoe, moving as much as 1 to 3 millimeters per year," UNR Professor Geoff Blewitt said. "The puzzling results of our earlier research cannot be explained easily by geology alone. We've now found that a reason for the rapid uplift may be linked to human activity."

The newest chapter of research shows draining of the aquifer for agricultural irrigation in the Central Valley results in upward flexing of the earth's surface and the surrounding mountains due to the loss of mass within the valley. The groundwater subsidence was found to also correlate with seismic activity on the San Andreas Fault.

In the past 150 years, about 40 trillion gallons of groundwater in the Central Valley have been lost through pumping, irrigation and evapotranspiration. That's roughly equal to all the water in Lake Tahoe, the volume of which can cover the entire state of California in 14 inches of water.

"This massive withdrawal of water has relieved pressure on the Earth's crust, which is now rebounding upward in response," Blewitt said. "This is counter-intuitive to most people, even geologists, who tend to only think that water withdrawal causes subsidence, which is only true in the sediments of the valley from which the water is withdrawn. With the weight of

the groundwater missing, the hard-rock crust under the valley is actually rising too.”

The rise is quite fast in geologic time, with these mountain ranges rising by a similar amount each year – about the thickness of a dime – with a cumulative rise over the past 150 years of up to 6 inches, according to the team of geophysicists.

Blewitt and colleague Bill Hammond, who run the Nevada Geodetic Laboratory at UNR, partnered with University of Western Washington, UC Berkeley and University of Ottawa in the research.

“The real importance of this research is that we are demonstrating a potential link between human activity and deformation of the solid Earth, which explains current mountain uplift and the yearly variation in seismicity,” said Colin Amos, assistant professor of geology from Western Washington University and lead author of the Nature article. “These are questions that lots of geologists have been puzzling over, and it’s a real eye opener to think that humans are the ultimate cause.”

Blewitt shared the research in a presentation at the European Geophysical Sciences Union conference in Vienna on April 28. The annual EGU General Assembly is the largest and most prominent European geosciences event.

The study is based on detailed GPS measurements from California and Nevada between 2007 and 2010.

– *Lake Tahoe News staff report*