

Study sheds new light on Mammoth Mountain's age

David Perlman, San Francisco Chronicle, 3-8-10

Beneath the 12 feet of snow that cover the ski slopes of Mammoth Mountain this winter, the tumbled rocks and restless ground tell a story of volcanic eruptions and earthquakes that shaped the region over thousands of years.

Now, that story has been retold in fresh detail - and with a new timetable - by a team of Stanford earth scientists. They found that geological activity occurred much more recently than previously thought to create the mountain and raise the chain of nearby smaller volcanoes stretching south for 40 miles from Mono Lake to the Mammoth area.

The mountain itself is an old volcano 11,000 feet high at its summit that built its own bulk from eruptions about 68,000 years ago. In scientific terms, the mountain formed abruptly, "almost certainly in less than 2,000 years," said geologist Gail A. Mahood, who led the team of scientists.

The string of nearby volcanoes, whose eroded domes are known as the Mono and Inyo craters, were formed much later - some time after 9,000 years ago, Mahood said.

The scientists' findings were published last week in the Bulletin of the Seismological Society of America.

Helpful for the future

The work of Mahood's team "provides a slew of new and accurate dates for eruptive events at Long Valley that we can certainly apply for estimating the probability of future events there," said Margaret Mangan of the U.S. Geological Survey in Menlo Park. She is the scientist in charge of the Long Valley Observatory, a network of instruments placed in the ground throughout the Mammoth Mountain region to monitor geologic hazards.

To reach their conclusions, Mahood and her colleagues conducted geologic surveys of the region over several years, determining the age of the rocks by studying their radioactive isotopes.

To collect lava samples, Mahood herself hiked the rough terrain of the mountainous survey area and climbed inside a broad low-lying feature called the Long Valley Caldera.

The caldera is a huge crater 20 miles long and 11 miles wide, the sunken remains of a monstrous volcano that erupted 760,000 years ago in one of the most violent explosions on record. It spread volcanic ash over what are now 14 Western states - as far east as Kansas and Nebraska.

Mahood and her team of scientists identified four relatively recent periods of activity they term "eruptive sequences" that have shaped the scenic region over the past 190,000 years. The oldest lasted until 160,000 years ago, she said, while the most recent began about 9,000 years ago and continues today.

It was during one of those past eruption periods that Mammoth arose, she said.

"The main bulk of Mammoth Mountain, and the rocks you stand on when you get out of the ski lift at the top, erupted over a short period of time - almost certainly less than 2,000 years," Mahood said.

Dating the mountain

That age makes the mountain much younger than earlier surveys reported. Some past studies had suggested it could have begun rising as long as 110,000 years ago in a series of eruptions that lasted for more than 50,000 years.

To determine the ages of the ancient lava throughout the region and the evidence of past earthquakes, Mahood and her colleagues used a technology known as argon-argon dating, based on the known time that one radioactive isotope of the gaseous element takes to decay.

David P. Hill, a long-time research geologist at the USGS in Menlo Park and recently retired scientist in charge of the Long Valley Observatory, said Mahood's work provides the best dates yet for the recurrence of volcanic events throughout the caldera region - a timetable essential for assessing future dangers.

"I wouldn't be surprised if within 50 years or so there were some kind of eruption in the area," Mahood said. But if any eruptions do occur in the near future, she said, "they would be really tiny."