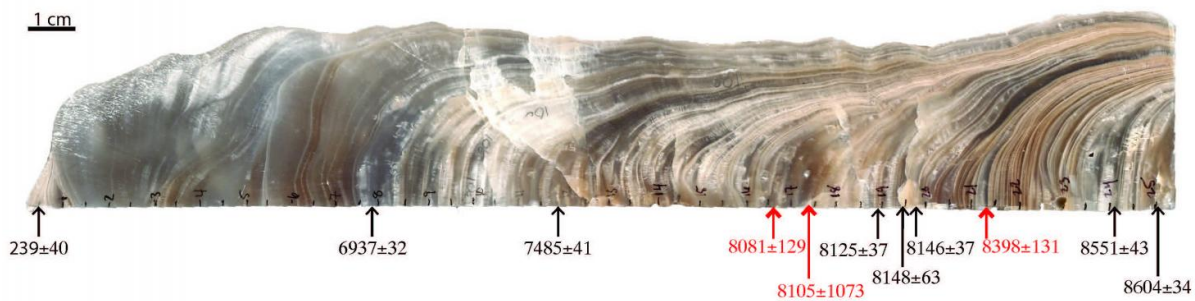


# Wet and stormy weather lashed California coast... 8,200 years ago

June 20 2017



A dated quarter section of the White Moon Cave stalagmite that spans the period of the Holocene anomaly. Credit: Jessica Oster, Vanderbilt University

The weather report for California 8,200 years ago was exceptionally wet and stormy.

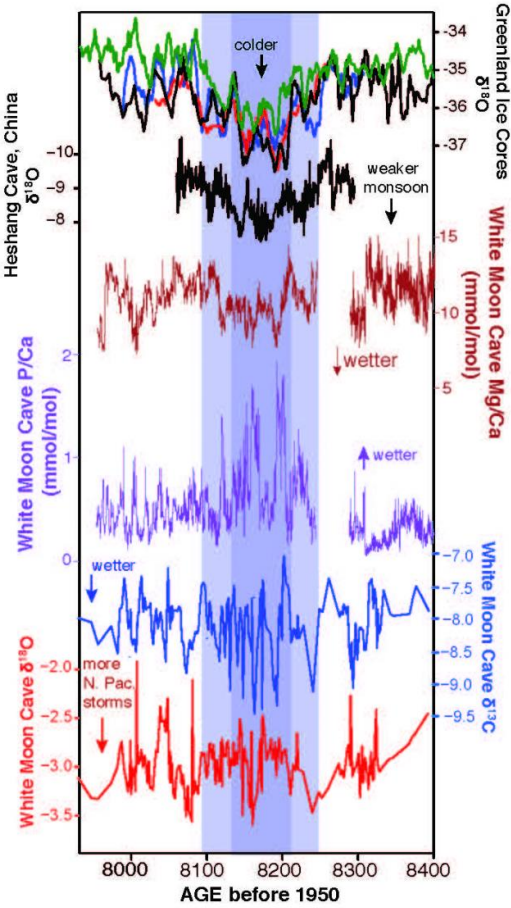
That is the conclusion of a paleoclimate study that analyzed stalagmite records from White Moon Cave in the Santa Cruz Mountains published online Jun. 20 in *Scientific Reports*.

The Golden State's 150-year stretch of unusually wet weather appears to have been marked by particularly intense winter storms and coincides with a climate anomaly in Greenland ice cores first detected in 1997. Before this "8.2 ka event" was discovered scientists thought the world's

climate had been unusually stable during the Holocene, the geological epoch that covers the last 11,700 years of Earth's history.

Since then researchers have associated the distinctive, 3.3-degree Celsius temperature dip in the Greenland ice cores with a catastrophic event: The drainage of two giant glacial lakes (Lake Ojibway and Lake Agassiz) located in northeastern North America caused by the collapse of massive ice sheet that covered much of the continent during the last ice age. In short order, the two lakes dumped enough melt water into the North Atlantic to disrupt the world's oceanic and atmospheric circulation patterns and raise the sea level by somewhere between two to 10 feet. The tremendous freshwater flood has been associated with an extended cold snap in Europe, increased drought in Africa, weakened monsoons in Asia and strengthened monsoons in South America.

"This is the first high-resolution evidence of the response of the coastal California climate to the most distinctive event in the Holocene. Although the effects appear to have been less severe than in other parts of the world, it provides us with new information about the nature of this global climate event," said Jessica Oster, assistant professor of earth and environmental sciences at Vanderbilt University, who directed the study.



Graph shows the results of the analysis of the White Moon Cave stalagmite

compared with the Greenland ice core record and comparable data from the Heshang Cave in China. Credit: Jessica Oster, Vanderbilt University

Oster is a member of a small community of earth scientists pioneering the use of [mineral deposits](#) in caves as proxies for the prehistoric climate. Cave formations, including stalagmites and stalactites, can provide valuable information about the climate for the last 600,000 years. They have a built-in clock: The mineral deposits contain radioactive uranium-234 that decays into thorium-230 at a constant rate so the ratio of the two isotopes is determined by the date the mineral deposit formed. Seasonal variations in water seepage produce layers that can be dated with considerable precision. The ratios of other isotopes in the minerals including oxygen and carbon provide information about the temperature and nature of the vegetation in the region at the time the layers formed. Concentrations of trace elements like magnesium, strontium and phosphorus provide information about how wet the environment was.

"Events like this are particularly difficult to study because they are so brief," said Oster. "Fast-growing stalagmites are particularly good for this purpose because they have very high temporal resolution."

With a five-year grant from the National Science Foundation, Oster is analyzing stalagmites from two California caves in order to shed new light on the factors that produced megadroughts in the region during the late Pleistocene and early Holocene. During her studies, she discovered a stalagmite that was growing rapidly just before, during and after the 8.2 ka event. By analyzing the oxygen and carbon isotope ratios and the concentrations of the trace elements phosphorus and magnesium in the mineral layers formed from 6,900 to 8,600 years ago, Oster and her collaborators extracted a considerable amount of information about what

was going on in the prehistoric California atmosphere.

According to the paper, "...the new record suggests that the 8.2 ka event was associated with a brief period of wetter conditions, potentially arising from increased storminess, and demonstrates a near synchronous climate response to this event on both sides of the Pacific."

Climatologists are particularly interested in this prehistoric event because it can provide insight into what would happen if global warming reaches a point where glaciers in Greenland and other parts of the globe melt rapidly enough to dump large amounts of fresh water into the ocean. In 2003, for example, the Office of Net Assessment at the U.S. Department of Defense produced a study of prospective [climate](#) change specifically based on this event.

**More information:** *Scientific Reports* (2017). [DOI: 10.1038/s41598-017-04215-5](#)

Provided by Vanderbilt University

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