

# ***Reconstructing precipitation patterns in California during past warmings and coolings of the last 20,000 years***

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**Abstract:** Records of past precipitation response in the American Southwest, including California, to warmings and coolings of the 20,000 years are important as baseline values for how precipitation patterns and source in this drought-prone region will change with future warming. Precisely dated records of the geochemical signatures of stalagmites from several central Sierra Nevada caves document changes in precipitation source and amount contemporaneously with major climate changes in Greenland at this time. Cool periods were overall wetter and fossil drip-water trapped in the stalagmites indicate a dominance of North Pacific-sourced storms and higher rainfall amount. Conversely, past warmer periods were drier and the fossil drip water compositions are consistent with the modern local meteoric water line. Past warm times were likely associated with a seasonal shift in rainfall and a greater contribution of yearly rainfall from atmospheric river events. Estimated paleo-temperatures in the central Sierran caves were 3.6°C cooler during the last ice age than the modern mean annual temperature.

Paleoclimate model-data comparisons for key intervals further indicate changing climate dynamics governing precipitation in California in response to past abrupt warmings and coolings. Climate simulations suggest that North Pacific winter storm tracks were likely more intense during past cool periods and a weakened storm track during warmer intervals. The integrated speleothem proxy records and proxy-model comparisons suggest the hydrological response in California is likely reduced winter precipitation and a shift to a subtropical moisture source with global warming, with clear implications for the future.

**Biography:** Virginia Tech alumna **Isabel Montañez** (PhD, 1990) is a sedimentary geologist and geochemist at the University of California, Davis, where she is Chancellor's Leadership Professor in the Department of Earth and Planetary Sciences. Isabel's work focuses on understanding Earth's climate history through the development of quantitative proxies for paleoclimate. She has published more than 125 peer-reviewed papers in the world's top scientific journals, and her work has been cited more than 5,000 times by other scholars. She has a special interest in "icehouse-to-greenhouse" climate transitions, and her first-authored paper in *Science* on deglaciation in the late Paleozoic has been marked as a "highly cited paper" by the Web of Science, placing it in the top 1% of all published papers in Earth science.

Isabel has won numerous awards in her career, including the 2017 Laurence L. Sloss Award of the Geological Society of America, which honors lifetime achievement in sedimentary geology (thus continuing a Hokie tradition, as this award has also recently been awarded to Emeritus Professor Fred Read and alumnus John Grotzinger). She has also been elected a Fellow of the Geochemical Society, the American Association for the Advancement of Science, and the Geological Society of America, and been awarded the James Lee Wilson Medal for Excellence in Sedimentary Geology (the Society of Sedimentary Geology's Young Scientist Award). Isabel is the current president of the Geological Society of America -- an elected position that exemplifies the high regard in which she is held by the international Earth science community.