



# THE LABORATORY OF TREE-RING RESEARCH

presents a talk by

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*Past climates of the Rocky Mountains: Cave  
speleothems reveal changing drought patterns through  
time*

Wednesday, February 18, 2026 - 12:00pm to 1:00pm

Room: Bannister 110

Speleothems are cave minerals that preserve signals of past climate in their geochemical composition. In the western United States (US), speleothem-based climate reconstructions can provide valuable insight into the long-term evolution of modern drought patterns that impact agriculture, ecosystems, and human communities today. The El Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO) are key drivers of cool-season precipitation variability and drought in the western US, including the Rocky Mountains. Together, they help modulate the north-south “precipitation dipole,” a regional climate pattern operating on multi-decadal timescales that leads to dry conditions north of ~40°N latitude when the south is wet, and vice versa.

Here, I investigate the natural evolution of this climate pattern using two precisely-dated (5900 years ago to present), coeval, multi-proxy stalagmite records of hydroclimate from Titan Cave, Wyoming, located just north of the modern-day dipole transition zone. Consistent trace element and stable isotope variations in both stalagmites reflect changes in the amount and seasonality of regional precipitation, documenting decreased winter snowfall and dry conditions over multi-decadal intervals characterized by the warm phase of the PDO and more frequent and stronger El Niño events. Future work at Titan Cave seeks to go beyond reconstructions of rainfall and drought by incorporating novel approaches to build histories of past wildfire activity in the region.