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A North American Hydroclimate Synthesis (NAHS) of the Common Era



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A North American Hydroclimate Synthesis (NAHS) of the Common Era

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Abstract

This study presents a synthesis of century-scale hydroclimate variations in North America for the Common Era (last 2000 years) using new age models of previously published multiple proxy-based paleoclimate data. This North American Hydroclimate Synthesis (NAHS) examines regional hydroclimate patterns and related environmental indicators, including vegetation, lake water elevation, stream flow and runoff, cave drip rates, biological productivity, assemblages of living organisms, and salinity. Centennial-scale hydroclimate anomalies are obtained by iteratively sampling the proxy data on each of thousands of age model realizations and determining the fractions of possible time series indicating that the century-smoothed data was anomalously wet or dry relative to the 100 BCE to 1900 CE mean. Results suggest regionally asynchronous wet and dry periods over multidecadal to centennial timescales and frequent periods of extended regional drought. Most sites indicate drying during previously documented multicentennial periods of warmer Northern Hemisphere temperatures, particularly in the western U.S., central U.S., and Canada. Two widespread droughts were documented by the NAHS: from 50 BCE to 450 CE and from 800 to 1100 CE. Major hydroclimate reorganizations occurred out of sync with Northern Hemisphere temperature variations and widespread wet and dry anomalies occurred during both warm and cool periods. We present a broad assessment of paleoclimate relationships that highlights the potential influences of internal variability and external forcing and supports a prominent role for Pacific and Atlantic Ocean dynamics on century-scale continental hydroclimate.

Keywords

Paleoclimate; North America; Common Era; Drought

1. Introduction

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