

Fechado de Iglesias, Construcciones Antiguas, y Sitios Arqueologicos con Tecnicas Dendrocronologicas

David W. Stahle

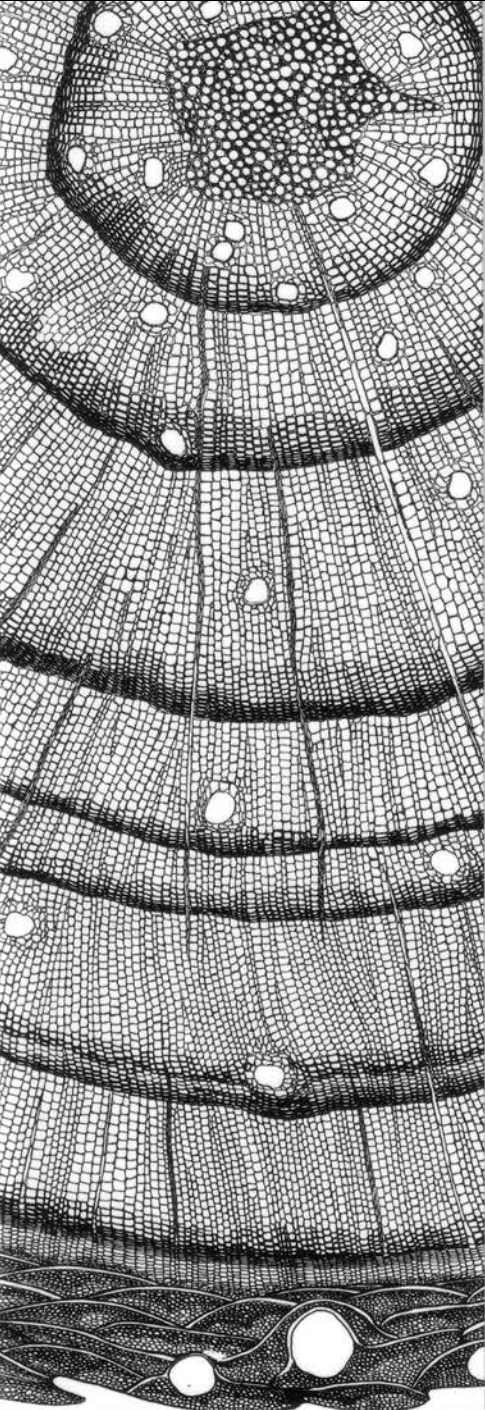
University of Arkansas, Fayetteville



Rio Nazas & La Laguna, 1766

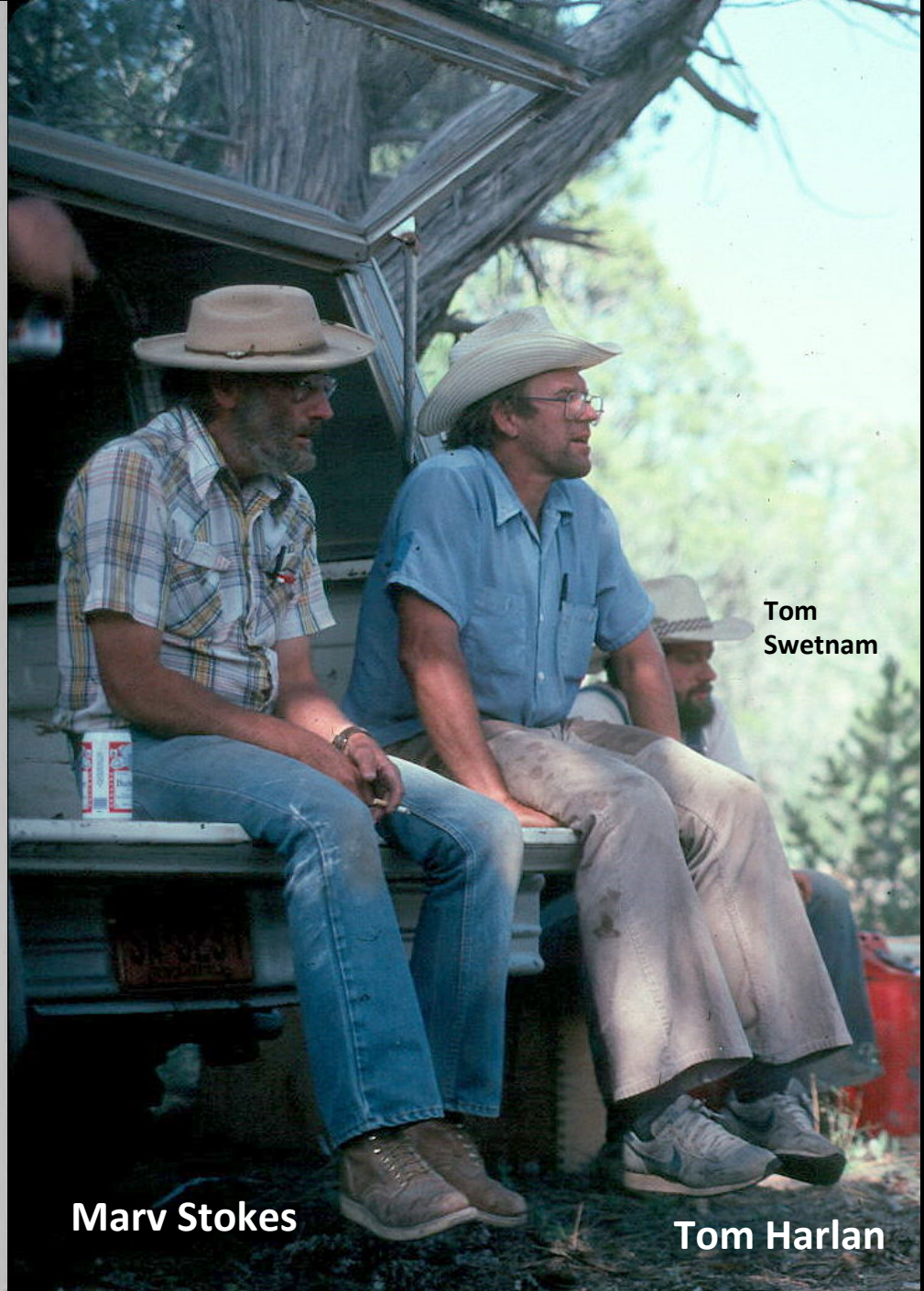
Nicholas de la Fora & Jose de Urrutia

World Digital Library: "Map of the Border of the King's Dominion in the Northern America" = guide to historic sites.



An
Introduction
to
**TREE-
RING
DATING**

Marvin A. Stokes
and
Terah L. Smiley



Tom
Swetnam

Marv Stokes

Tom Harlan

La Misión de la Señora del Pilar y Santiago de Cocóspera, Sonora

1973



Founded by Father Eusebio Kino in 1687

Existing structure built in 1780s?

Population decline & abandonment in 1870

Destroyed by Cananea Earthquake of 1887

Mesquite timbers used for staircase (unsuitable). Only a few churches were dated during this Univ Arizona project, mainly in the Tarahumara region, partly due to scientific bias.

San Francisco de Assisi Rancho de Taos, New Mexico



NPS photo 1934

**Well-known 18th Century Spanish Colonial church, Taos Founders artist colony
age of existing structure in dispute.**

San Francisco de Assisi Rancho de Taos, New Mexico

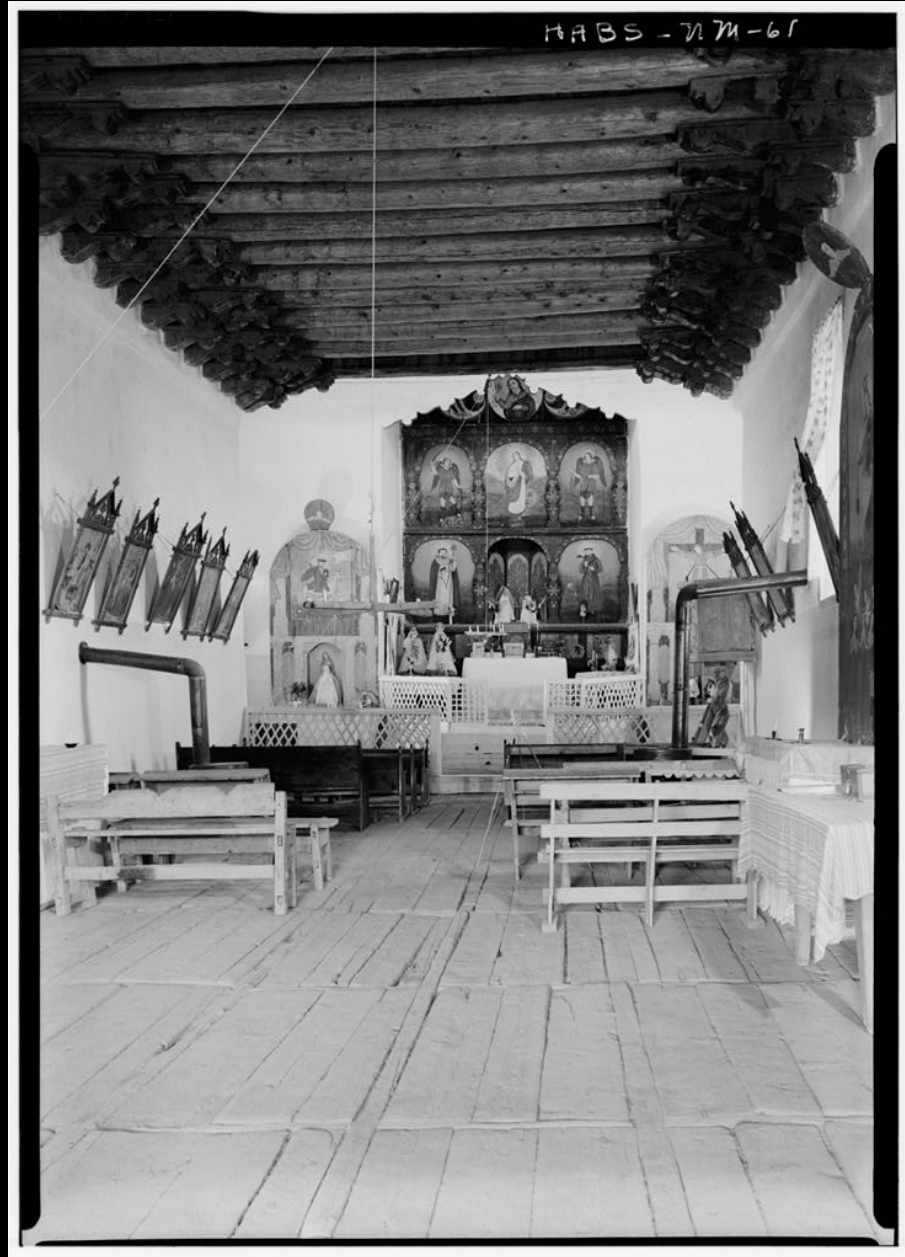


NPS photo 1934

36-N.M.:7

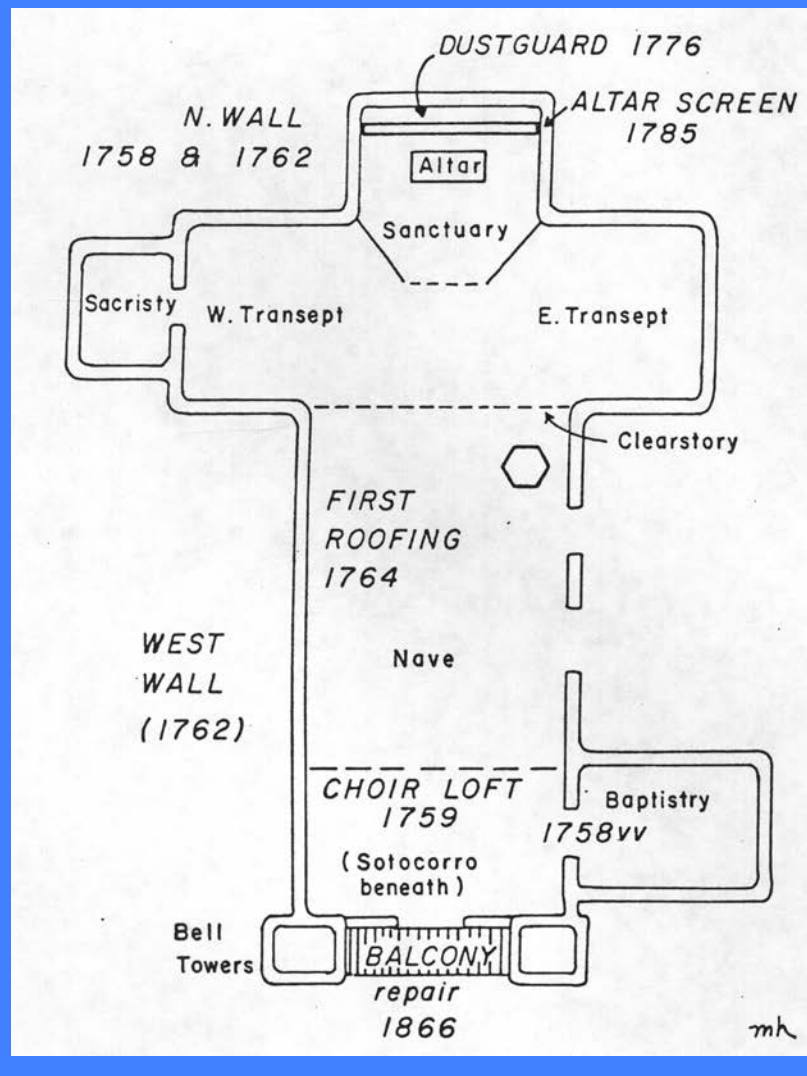
Franciscan Mission founded in 1770' s. Cutting dates for vigas = 1816.
Hypothesis: Original church fell into ruin, rebuilt in 1816 (testable with archaeology).
Church restored in 1967, all vigas and most corbels replaced, carefully duplicating originals.
Sanctuary carvings are Spanish-era originals.

San Jose de Garcia, Las Trampas, New Mexico



NPS photos 1961

San Jose de Garcia Las Trampas, New Mexico



Tree-Ring Dates & Architectural Analysis:

1735 Cutting dates imply Spanish occupation of region 16 years before official land grant

1758 stockpiling of beams begins

1762 church under construction

1764 roof installed

1776 timbers cut for dust guard over altar

1785 new altar and altar screen built (reusing timbers from a pre-1760 structure)

1866 balcony vigas replaced

1930s and 1940s repairs

Martha Ames, 1972. University of Arizona.

Misión San Carlos Borroméo del Río Carmelo Carmel, California



NPS 2005

Beautiful, famous, & a very exclusive neighborhood

Misión San Carlos Borroméo del Río Carmelo Carmel, California



CWJ Johnson photo 1870

**Founded by Father Junipero Serra in 1770 (Serra buried here)
Initially relied on bear meat from Mission San Antonio de Padua & supply ships from San Diego de Acala
Authentically restored by H. Downie, a U.S. National Historic Landmark, an active parish church,
Visited by Pope John Paul II in 1987.**

Misión San Carlos Borroméo del Río Carmelo Carmel, California, 1883



Construction & repair dates not well known, some original wood remains.

Santo Domingo Chiapa de Corzo, Chipas



Founded on Rio Grijalva in late 1500s by Friar Pedro de Barrientos.

Huge potential for tree-ring dating of historic buildings in Mexico!

Zona Arqueológica de Paquimé

Instituto Nacional de Antropología y Historia



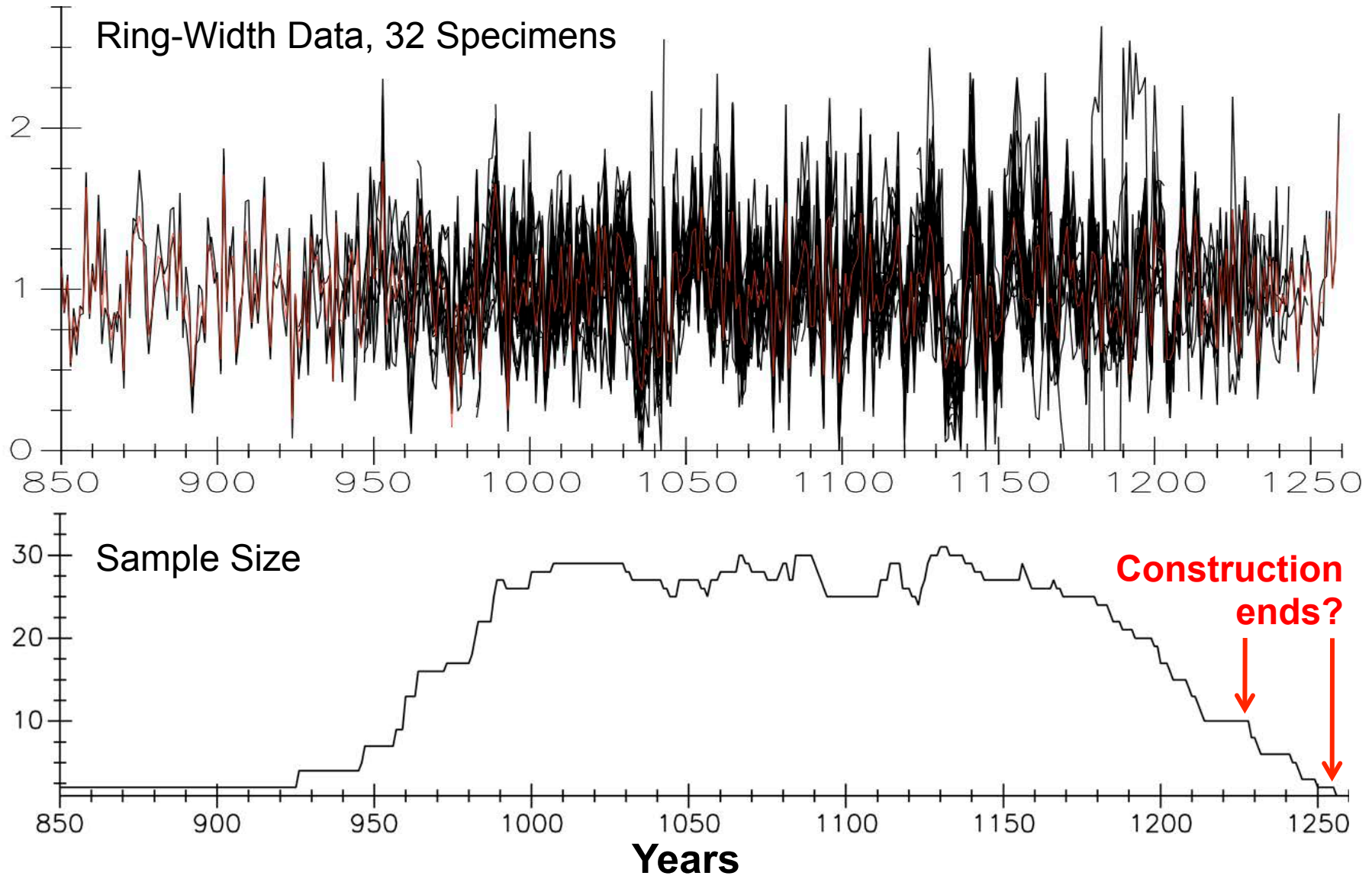
Casas Grandes, Chihuahua



Douglas-fir

UNESCO World Heritage Site, 1130-1450 AD, 2,500 inhabitants at Paquime, 10,000 in region. Multi-story apartments >2000 rooms, complex water control & sewage, effigy mounds, stone platforms, ballcourts, markets. 350 related sites in region. Aztec & Anasazi linkages? Abandonment? Dating wrong?

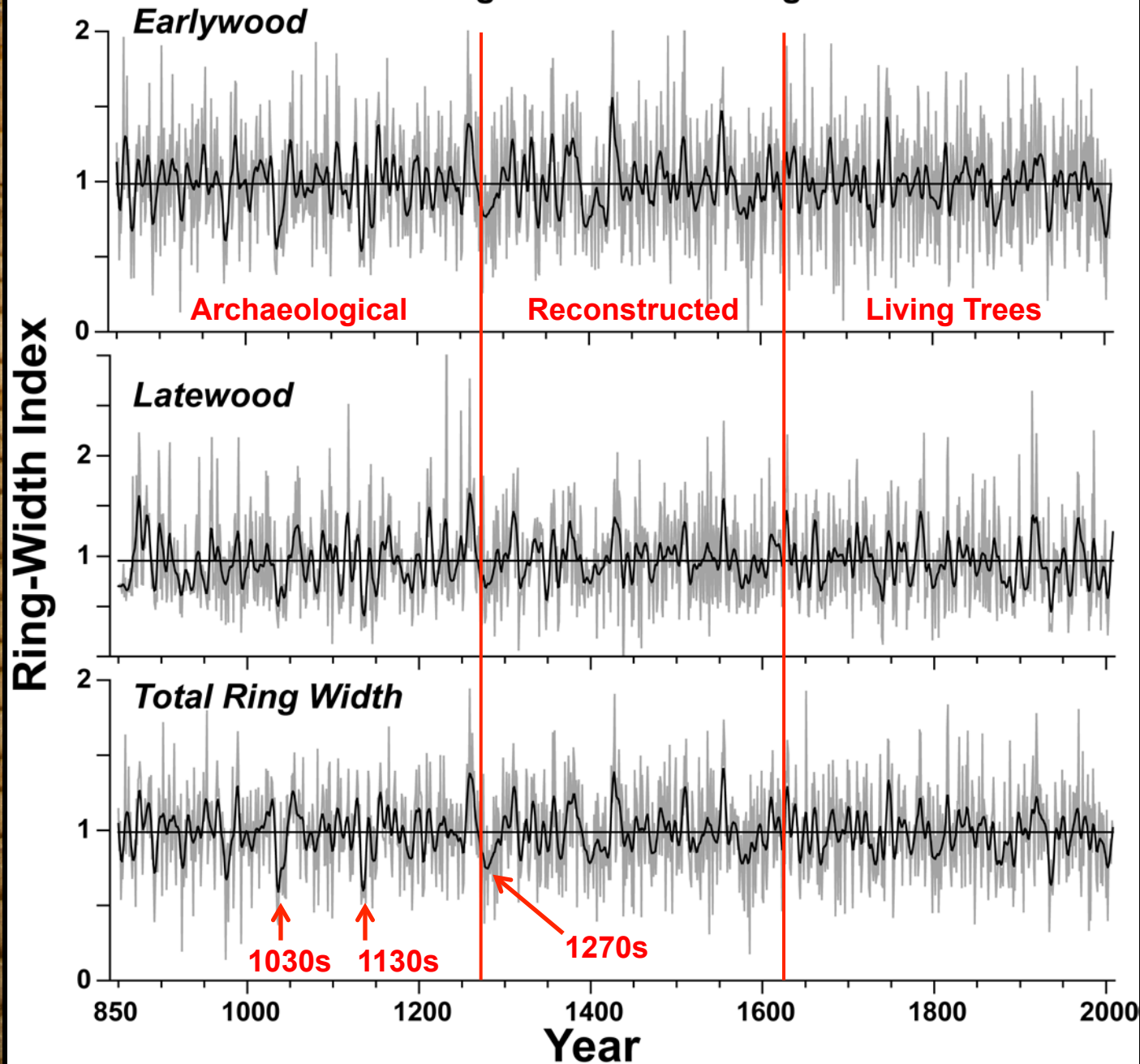
Paquimé Archaeological Chronology



Stuart Scott (1966) "Dendrochronology in Mexico" dated 78 shaped vigas from Paquime using long range correlation analysis with Four Corners master chronology, only one dated later than 1261 (1338vv). Re-analysis indicates CG225 was mis-dated and actually dates in the early 1200s.

Casas Grandes & Las Tinajas, Chihuahua

Archaeological Wood & Living Trees



Gap-fill Casas
chronology,
longest in
northern
Mexico

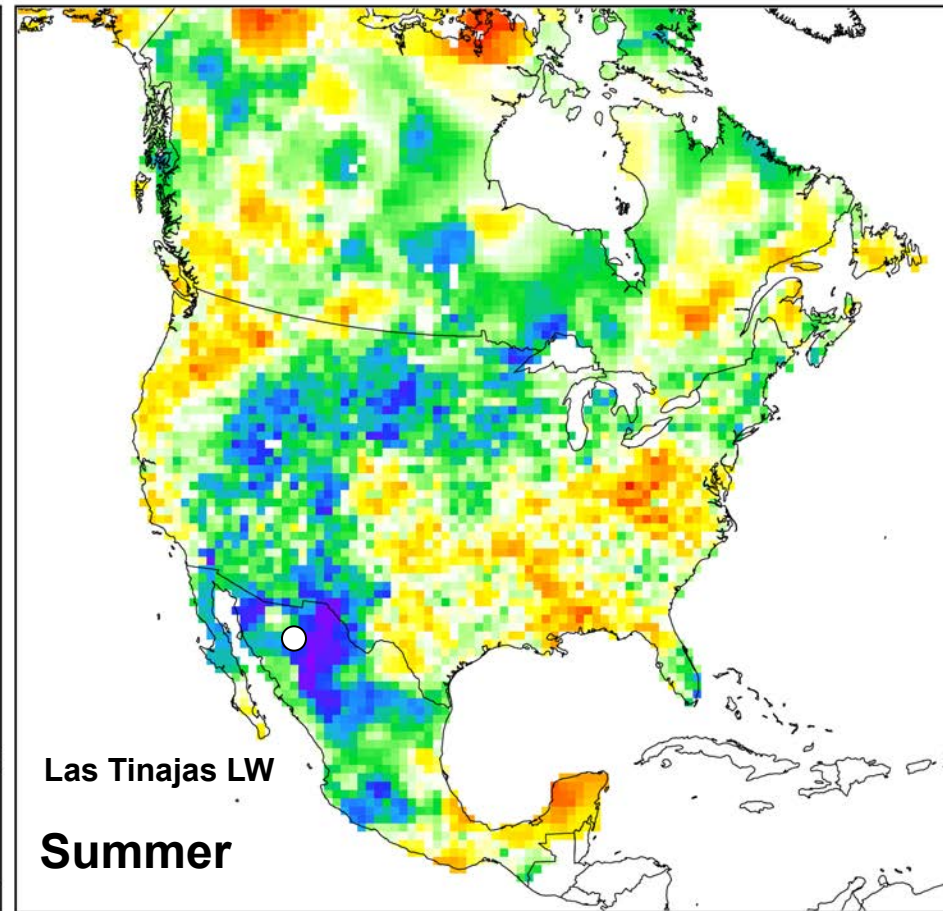
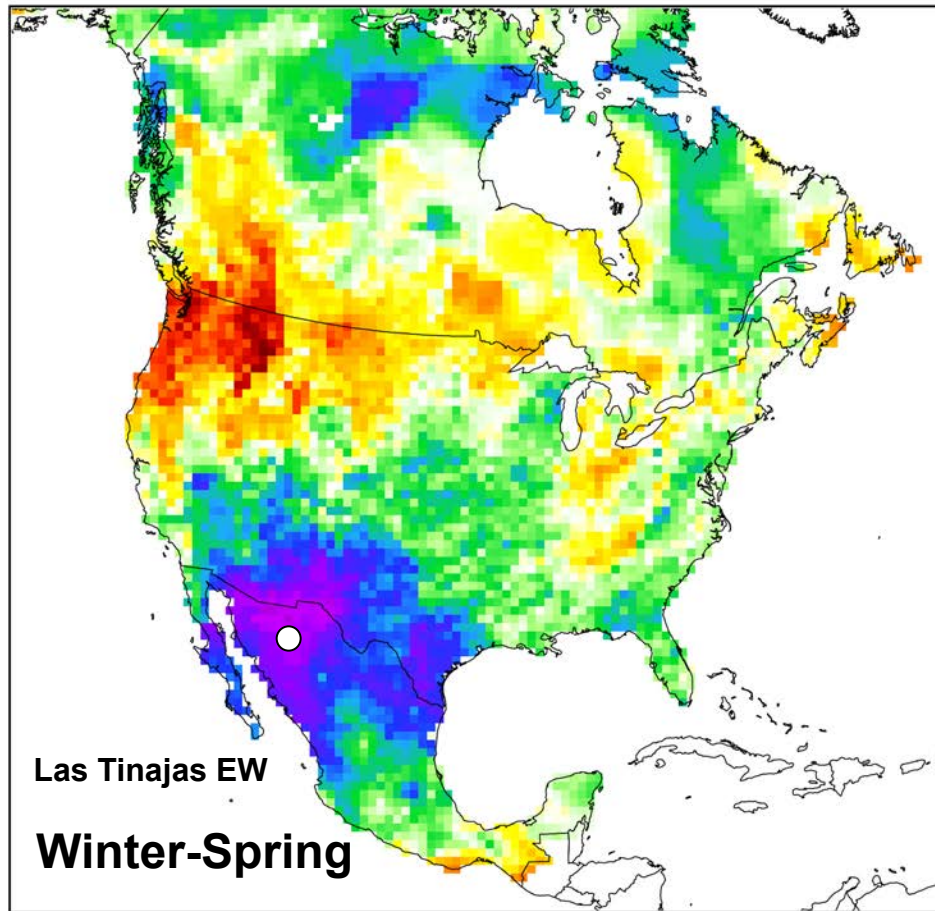
Droughts at
Paquime

Paleo-climatic
applications

Casas Grandes, Chihuahua, Douglas-fir

Earlywood vs. JFMAM Z-Index

Latewood vs. JJ Z-Index



Correlation



-0.8 -0.4 0 0.4 0.8

Climate signal in EW & LW, note tri-pole structure from southern Mexico - northern Mexico - Pacific NW

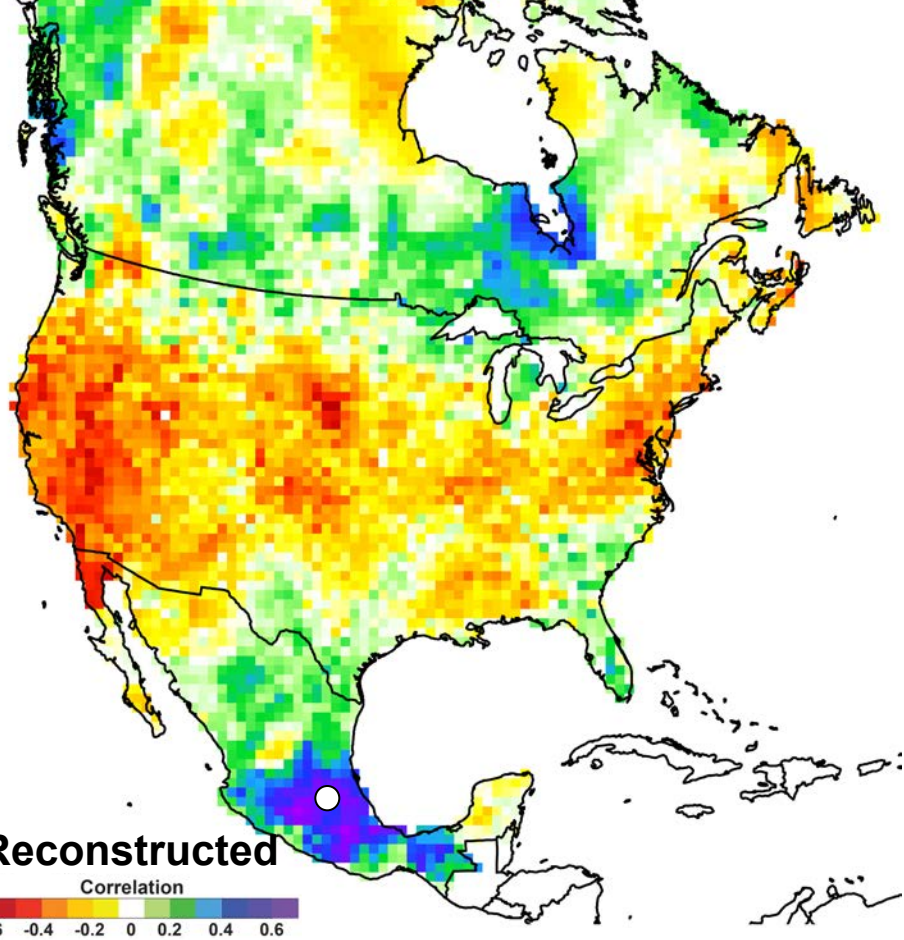
Montezuma Baldcypress Barranca de Amealco, Queretaro



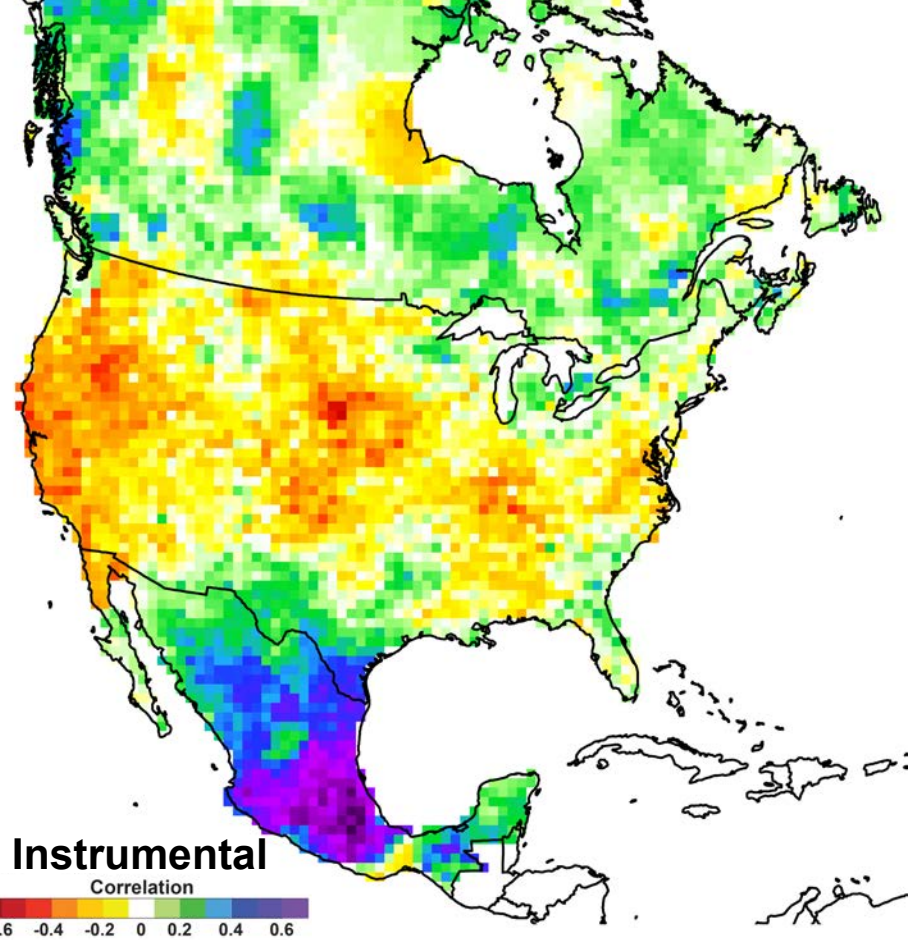
Mesa Central “habitat island,” 60 km from Tula, 90 km from Teotihuacan & Tenochtitlan



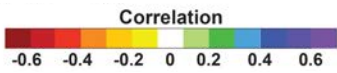
Jose Villanueva
Barranca de Amealco
among the oldest trees in Mexico



Reconstructed



Instrumental



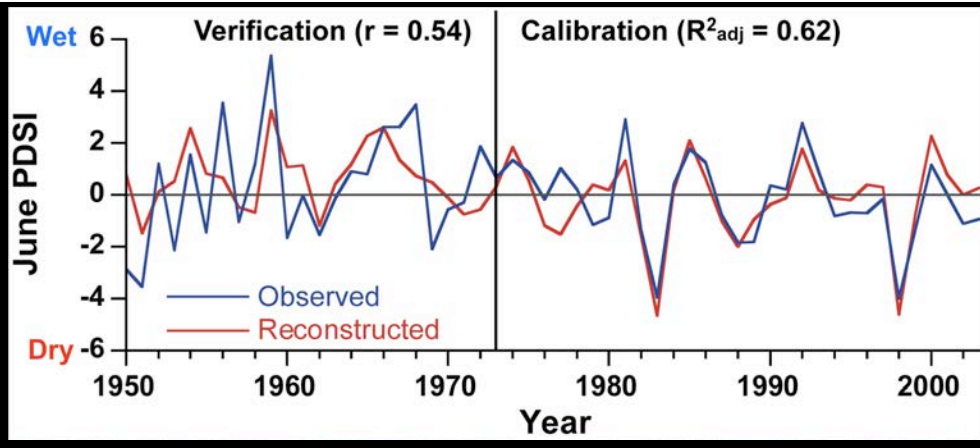
Predictor & Predictand correlated with June PDSI over North America

0.5° gridded PDSI data from RR Heim, Jr. (NCDC, NOAA)
 Correlation period = 1950-2003, (dot = Amealco)

Strong Mesoamerican climate signal (before the *canicula*)

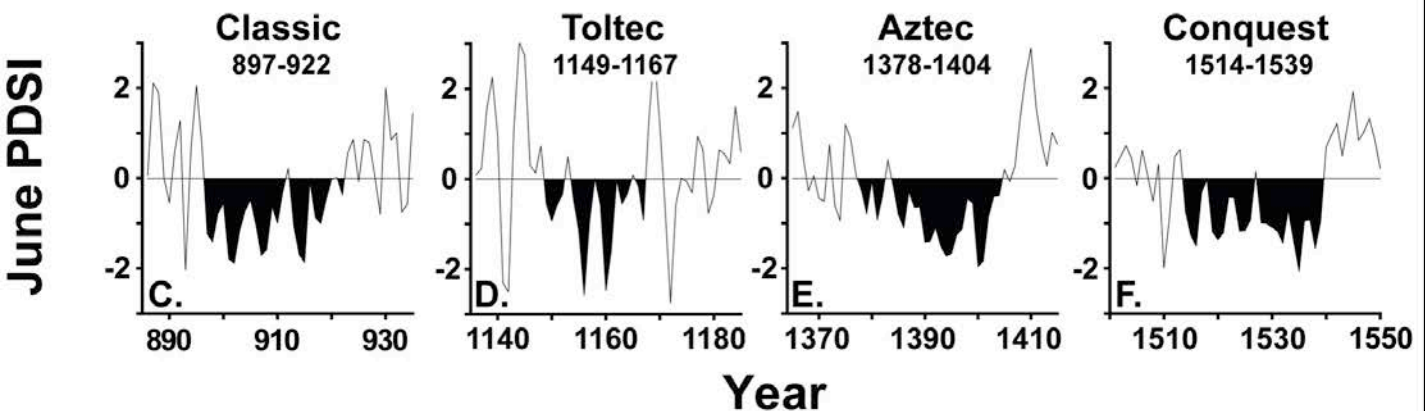
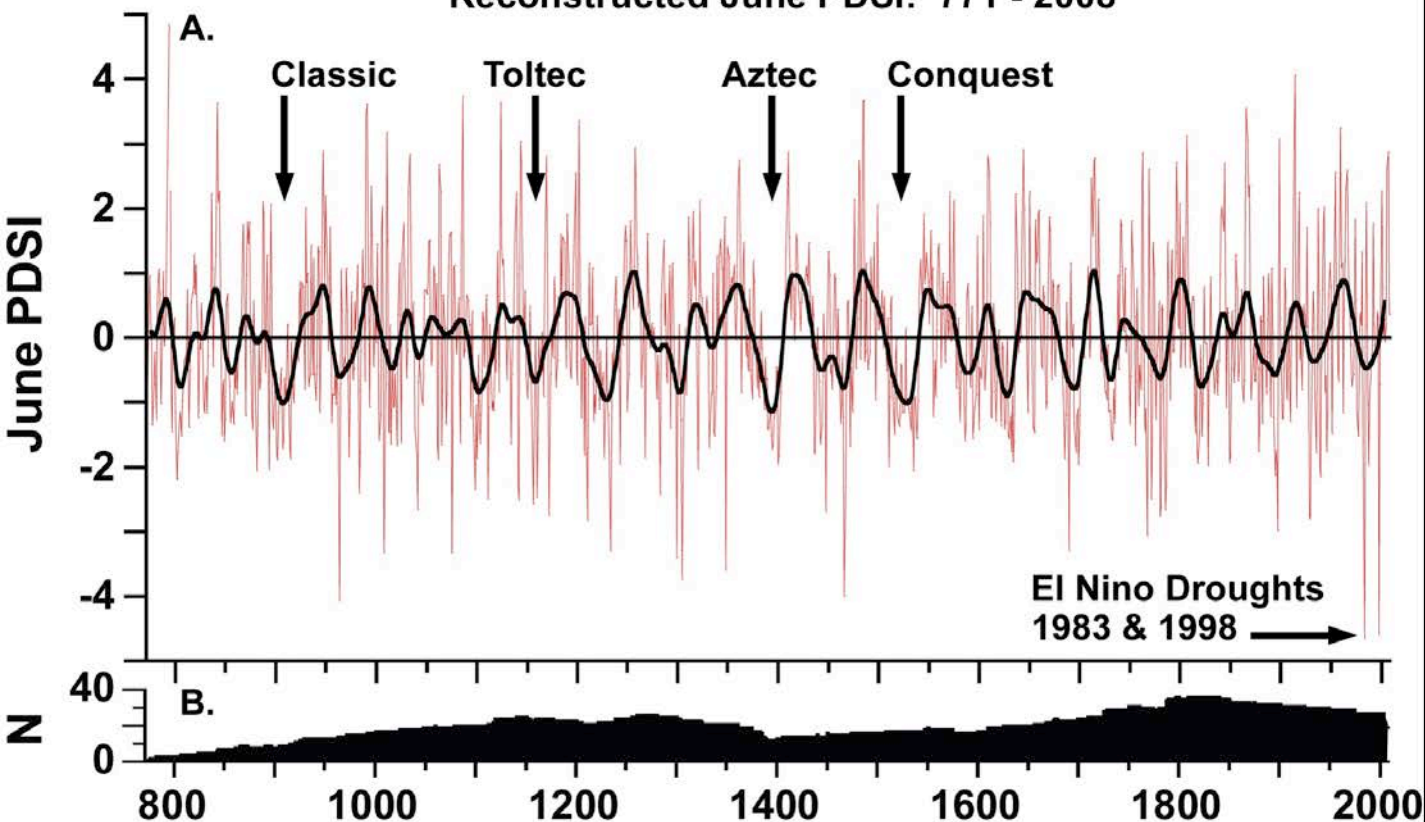
High quality large-scale climate signal encoded in the tree-ring chronology, reflects latitudinal moisture gradient, reality check with instrumental data

Extract and average 84 grid points from Mesoamerica



Mesoamerican Megadroughts

Reconstructed June PDSI: 771 - 2008



Longest exactly dated, annual record in Mesoamerica: 771-2008

Annual & multidecadal estimates

Significant Droughts:

Terminal Classic Drought

Toltec Drought

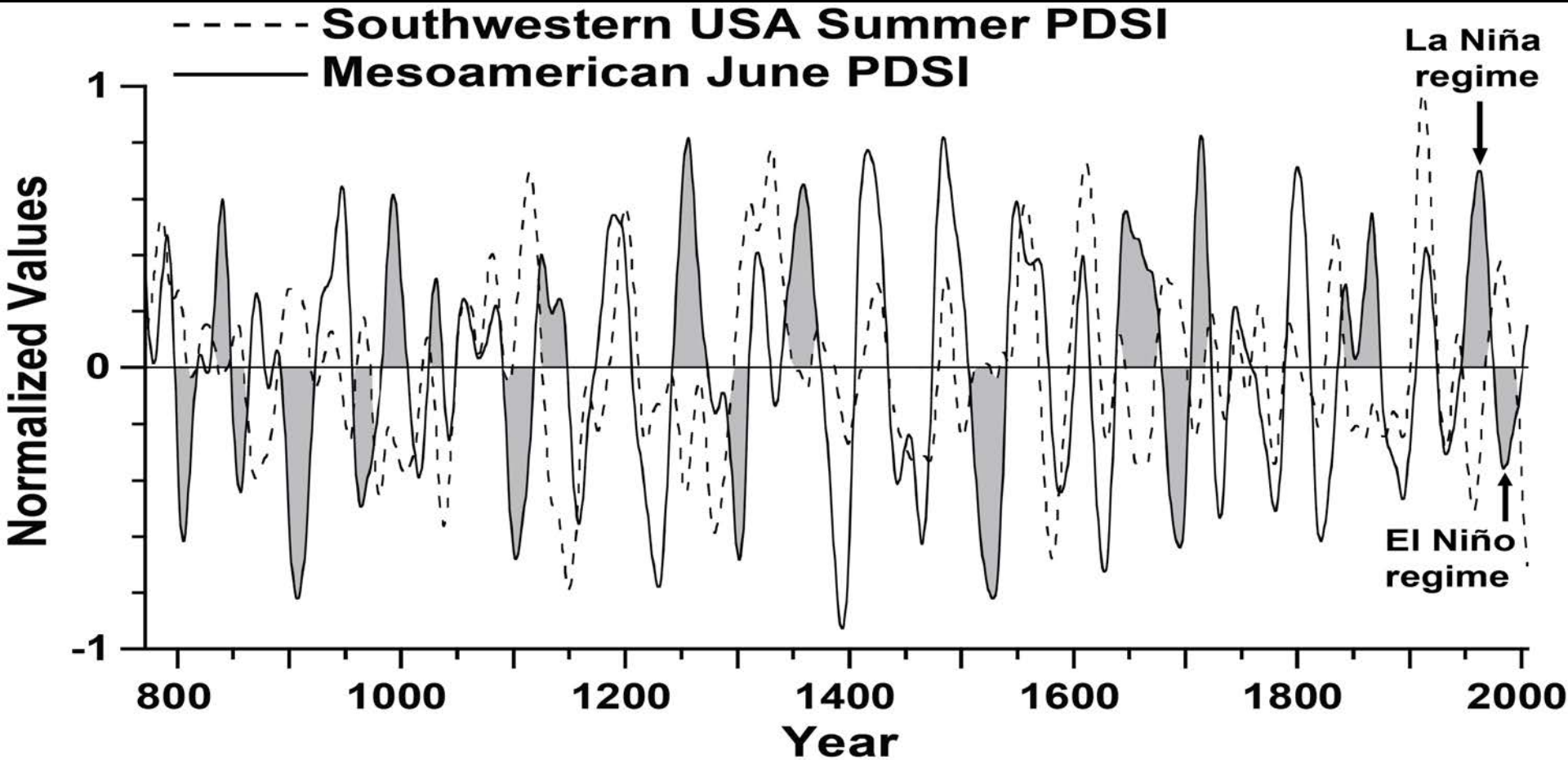
Aztec Drought

Conquest Drought

El Niño extremes of 1983 & 1998

Strong ENSO forcing, anti-phased with Southwest, use to fingerprint past forcing.

Anti-phasing between the SW USA & Mesoamerica



Simultaneous decadal moisture regimes over Mesoamerica & Southwest, implicates large scale forcing

Uncorrelated? (5x5 contingency, multidecadal correlations of both signs!); ENSO forcing? ITCZ regimes?

1980-1990s El Niño regime = drought over Mesoamerica, wetness over SW USA

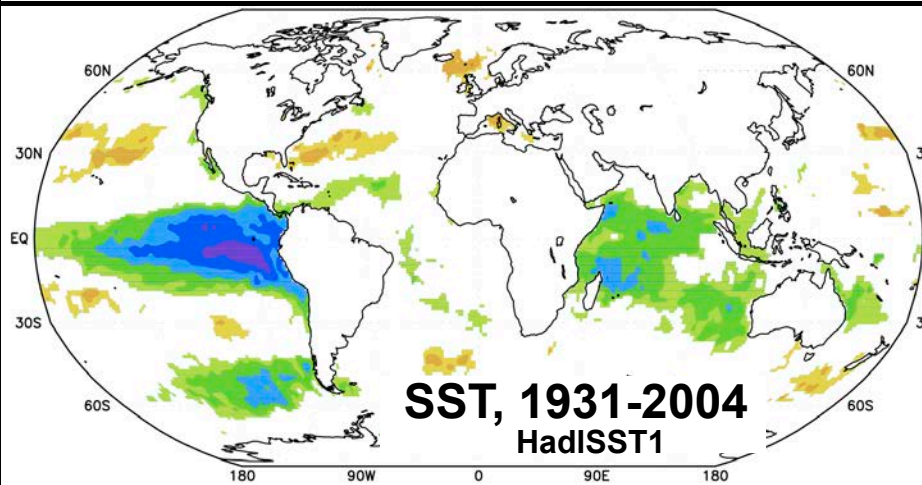
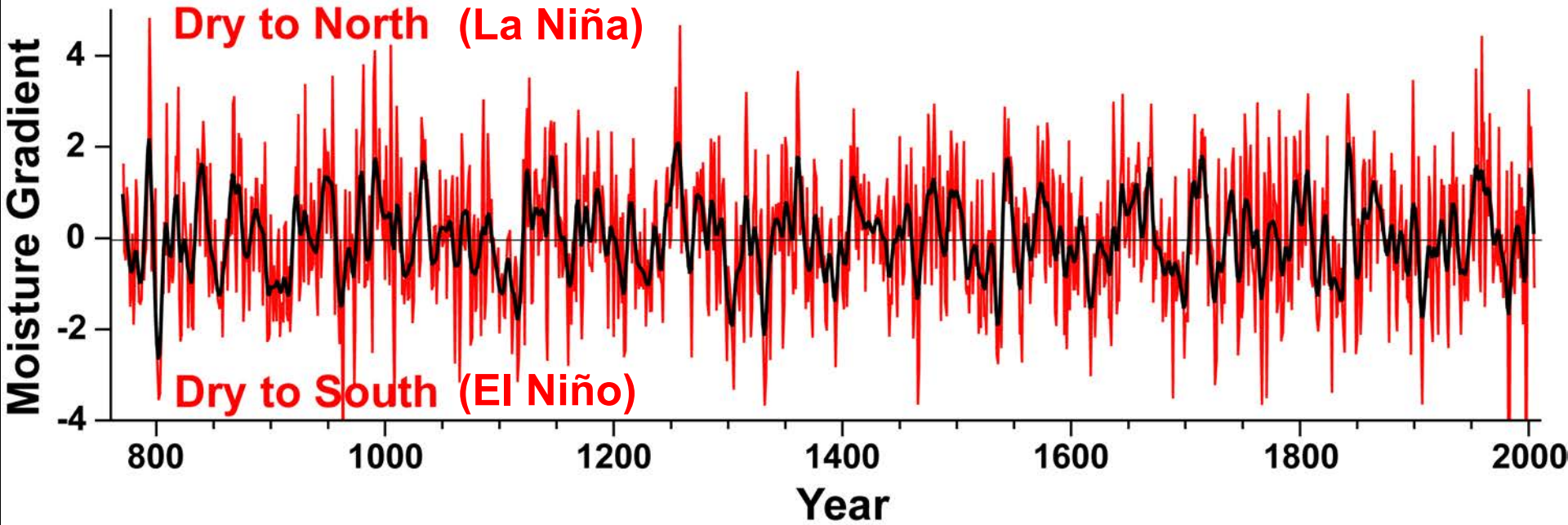
1950-1960s La Niña regime = wetness over Mesoamerica, drought over SW

Terminal Classic Drought, El Niño regime?

Late 13th Century Great Pueblo Drought developed during La Niña regime, ended by El Niño? Testable hypotheses.

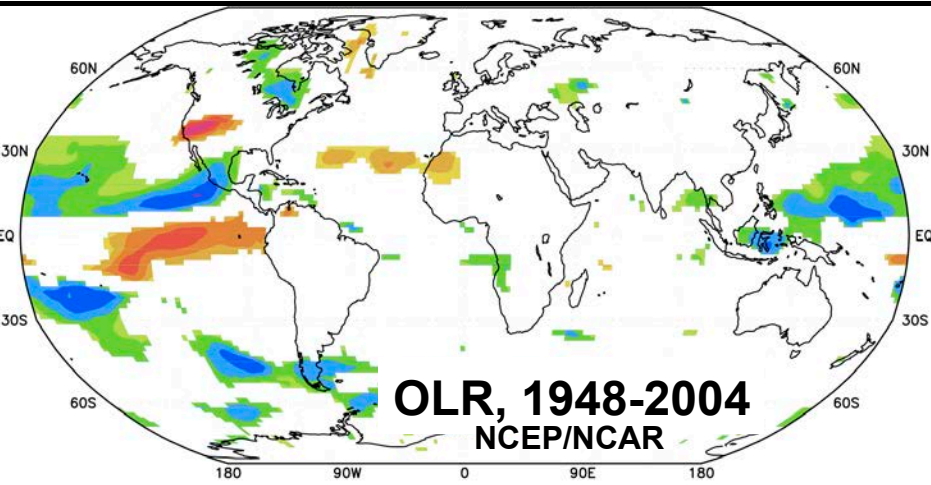
Tex-Mex Index

Moisture Gradient = Mesoamerica – Southwest USA

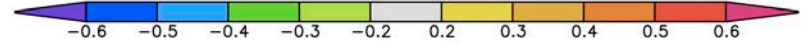
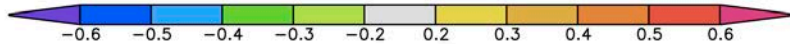


Correlation

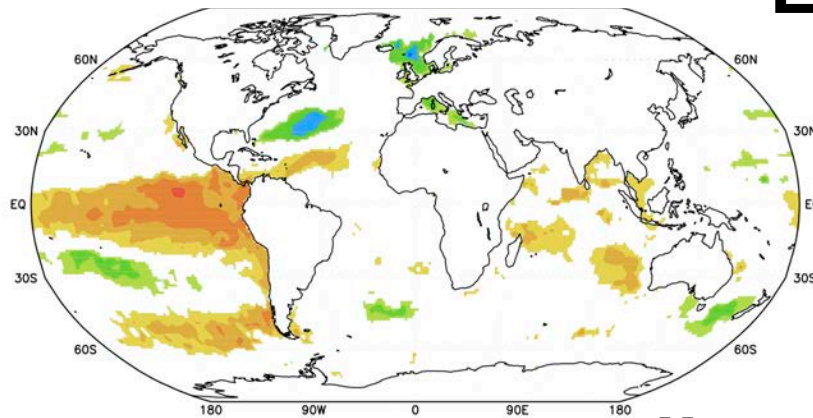
KNMI Climate Explorer



Correlation



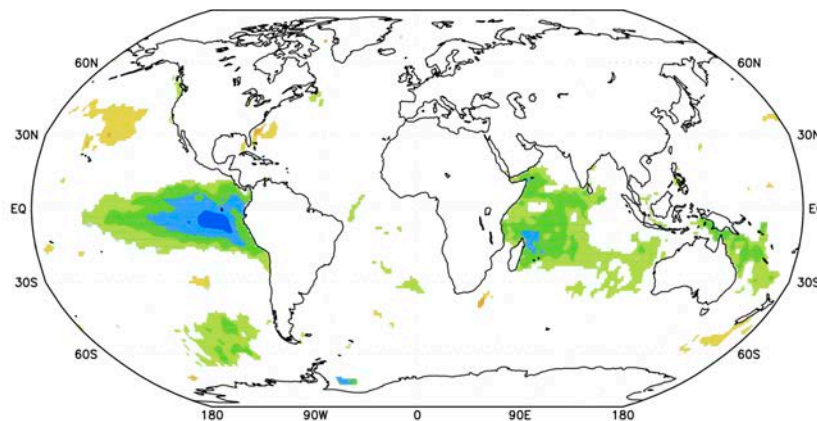
Southwest USA



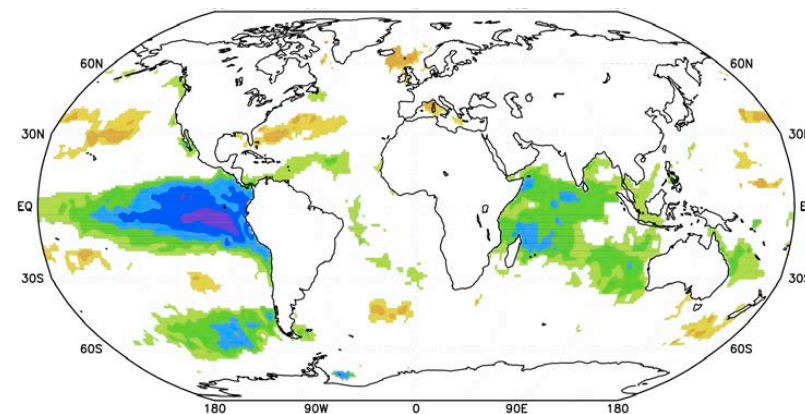
ENSO Signal Enhanced in the Tex-Mex Index

KNMI Climate Explorer, 1931-2004

Mesoamerica



Tex-Mex Index



Correlation

