

TALES FROM THE PAST: INDICATORS OF ANCIENT MAYA SOCIETAL STRUCTURES DURING THE 'CLASSIC MAYA COLLAPSE'



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Left: Lowell Houser (1938) *Evolution of Corn* (oil on canvas)

Right: Frederick Catherwood (1844) *Teocallis, at Chichen-Itza* (lithograph)

CLASSIC MAYA CIVILIZATION

1200 BC

The first sedentary villages in the Maya lowlands emerge.

700 BC

Mayan writing is developed and recorded.

300 BC

The social structure in Maya area adapts to include nobles and kings as rulers.

AD 683

Pakal, the king of Palenque, dies and is buried in the Temple of Inscriptions

AD 1502

First contact with Europeans made.

1000 BC

500 BC

AD 1

AD 500

AD 1000

AD 1500

800 BC

Evidence of long distance exchange with other parts of Mesoamerica.

400 BC

Earliest solar calendars are carved in stone.

100 BC

The first pyramids are built.

AD 450

The city-state of Tikal dominates the tropical lowlands.

AD 800

Sites are abandoned throughout the lowlands.

THE CLASSIC MAYA COLLAPSE

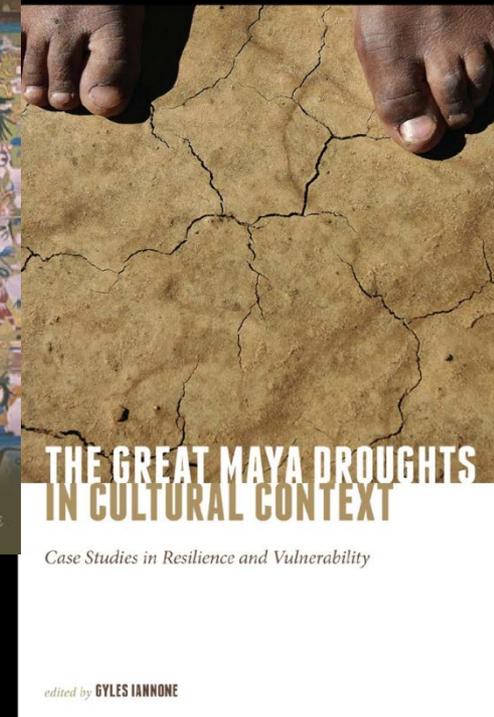
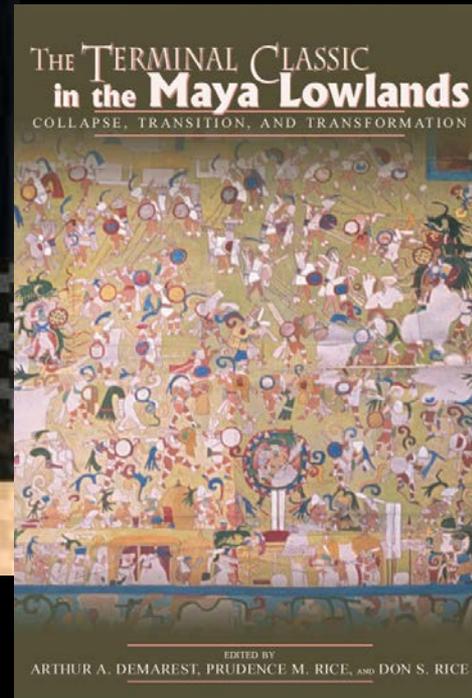
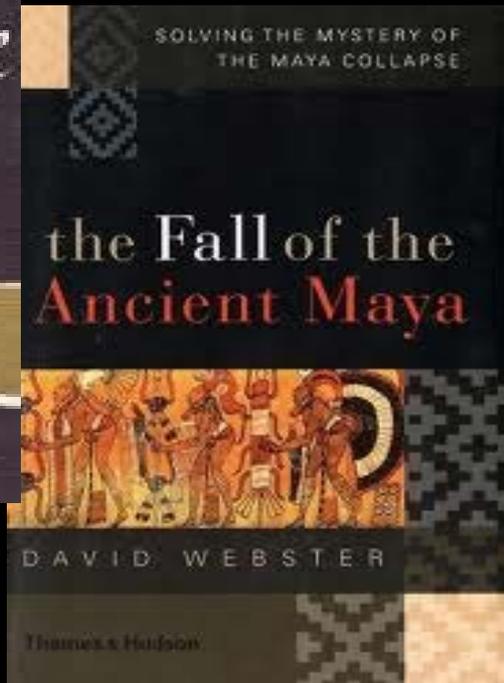
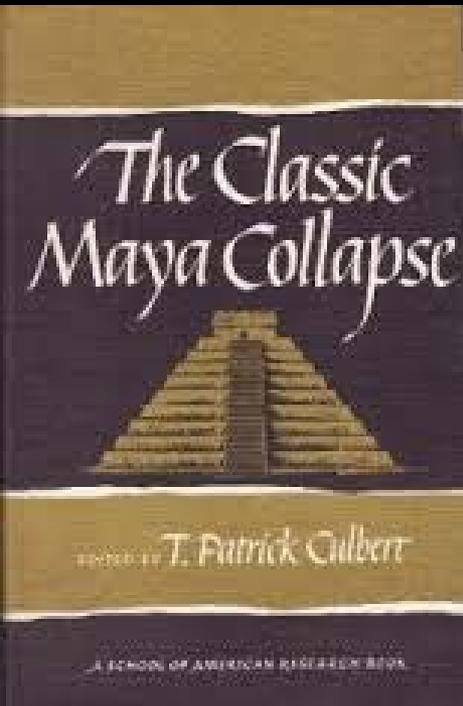


"Chichen Itza", oil painting by Craig Mullens

Frederick Catherwood's lithograph of the Castillo at Chichen Itza (1844)



THE CLASSIC MAYA COLLAPSE



THE CLASSIC MAYA COLLAPSE



Sociopolitical collapse of Classic Maya kingdoms between AD 750-1000

Political collapse: Divine (dynastic) rulership (k'uhul ajaw), monumental construction, writing, elite paraphernalia, carved monuments with long count dates.



Demographic collapse: Depopulation and abandonment of urban centers (and peripheries) across the region

Causes of collapse:

Social:

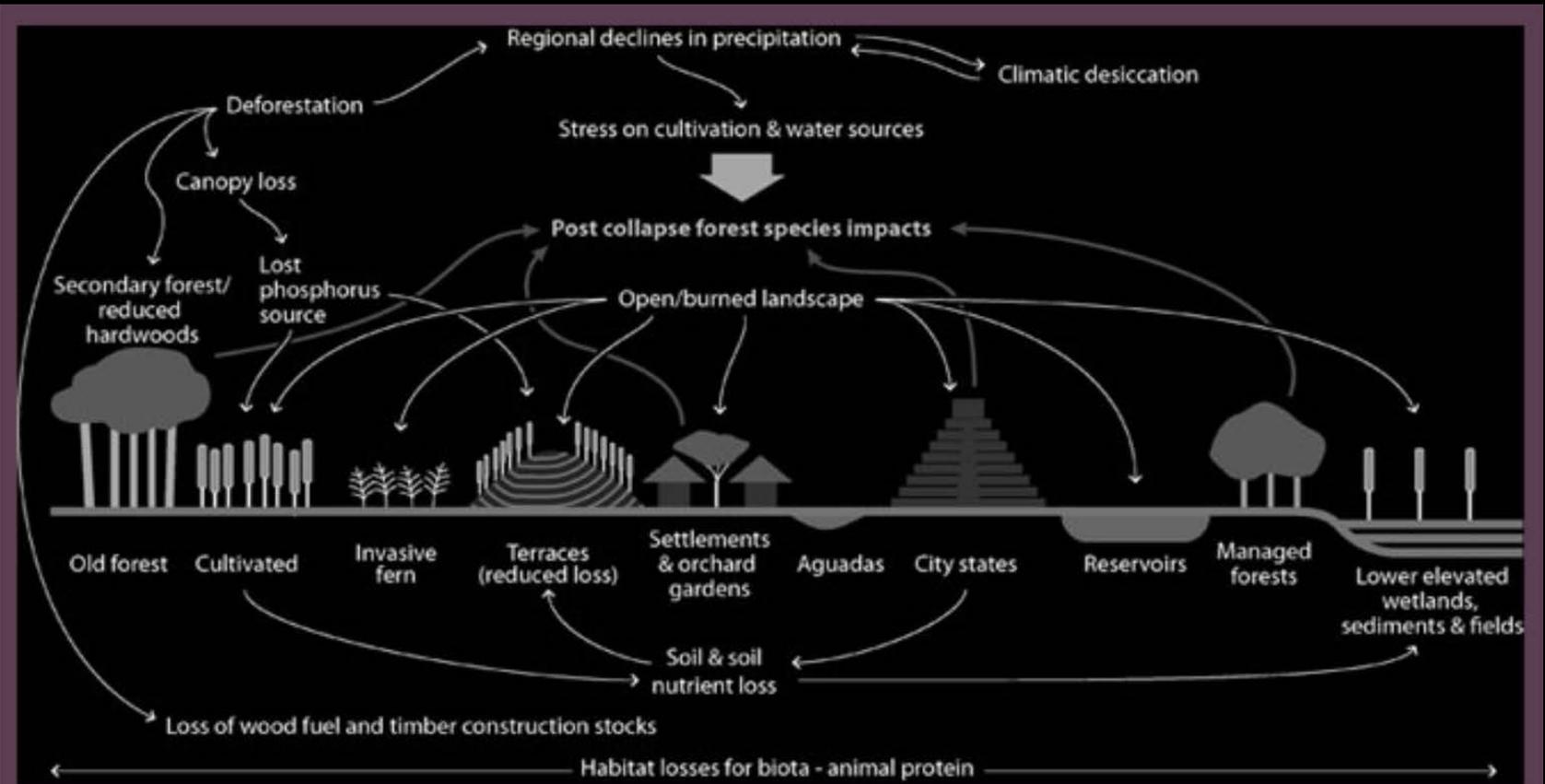
- Warfare
- Inter-elite rivalry
- Competition for trade routes / resources
- Popular uprising
- Invasion
- Cyclical fatalism

Environmental:

- Overpopulation
- Subsistence stress
- Deforestation
- Climatic stress (Drought)



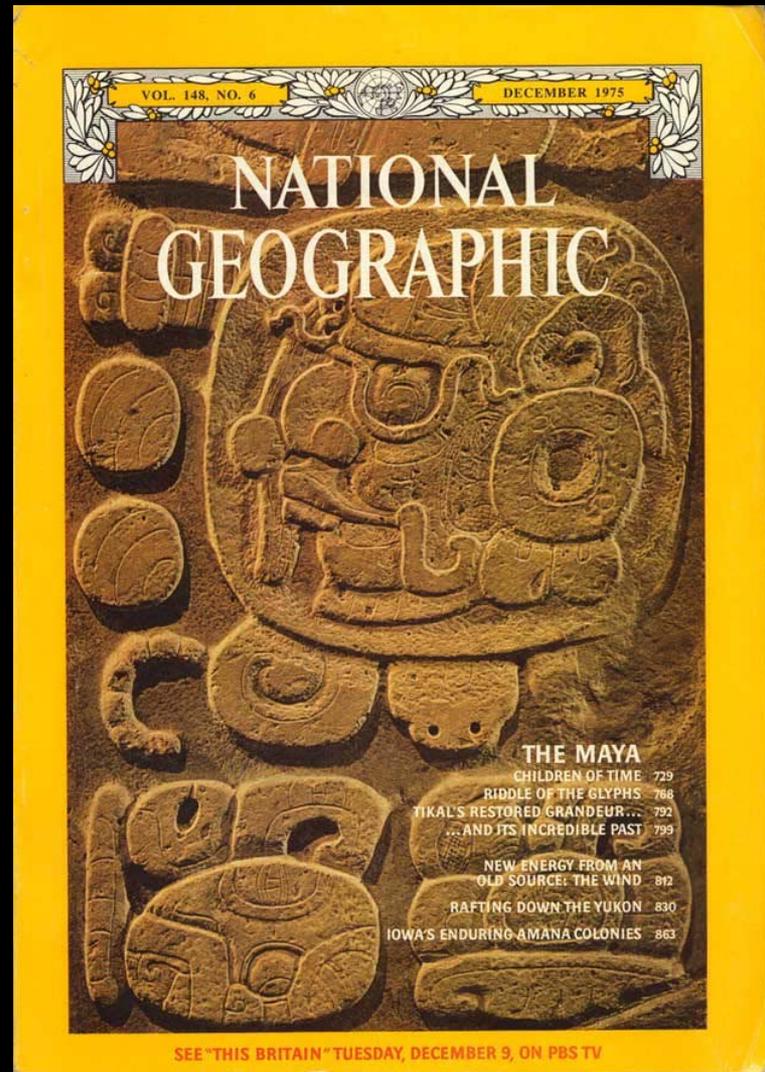
HUMAN-ENVIRONMENT SYSTEMS APPROACHES IN THE MAYA LOWLANDS



The relationships among various effects embodied in a climate-biophysical-land model for assessing how Maya city states respond to environmental change. (Courtesy of Billie Turner, Arizona State University.)

Turner, B. L., & Sabloff, J. A. (2012). Classic Period collapse of the Central Maya Lowlands: Insights about human-environment relationships for sustainability. *Proceedings of the National Academy of Sciences*, 109(35), 13908-13914.

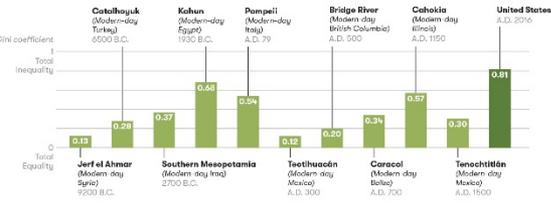
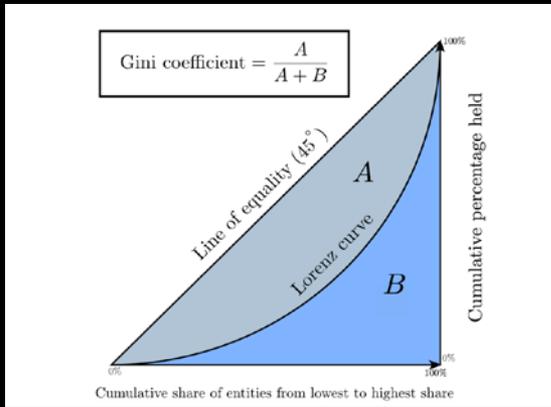
HOW DO ARCHAEOLOGISTS RECONSTRUCT SOCIAL CHANGE?



HOW DO ARCHAEOLOGISTS RECONSTRUCT SOCIAL CHANGE?



DEVELOPING ARCHAEOLOGICAL MEASURES THAT ARE COMPARABLE WITH MODERN DATA



Kohler, T.A., Smith, M.E., Bogaard, A., Feinman, G.M., Peterson, C.E., Betzenhauser, A., Pailles, M., Stone, E.C., Prentiss, A.M., Dennehy, T.J. and Ellyson, L.J., 2017. Greater post-Neolithic wealth disparities in Eurasia than in North America and Mesoamerica. *Nature*, 551(7682), p.619.

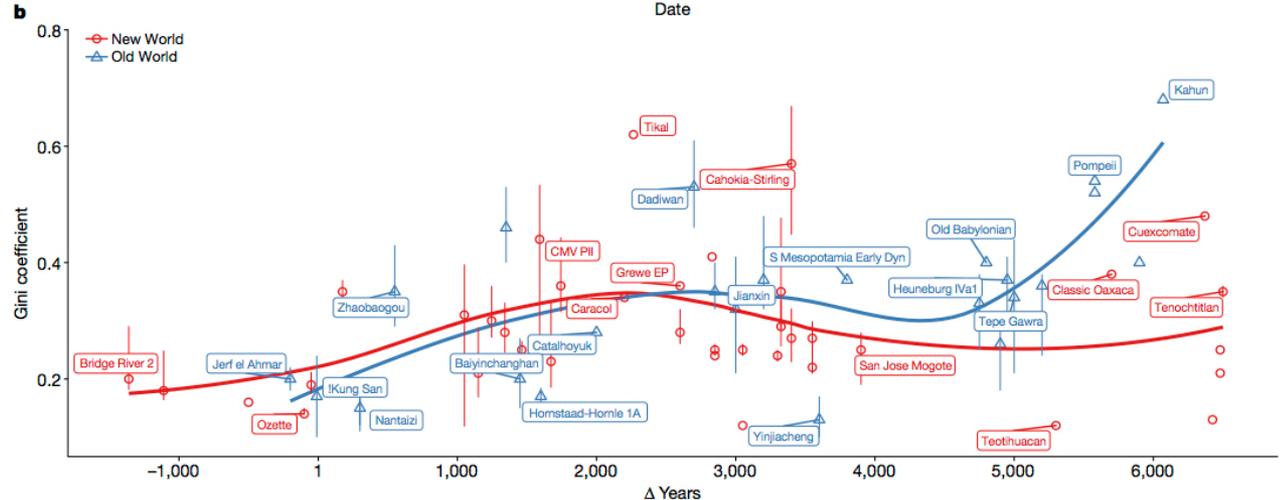
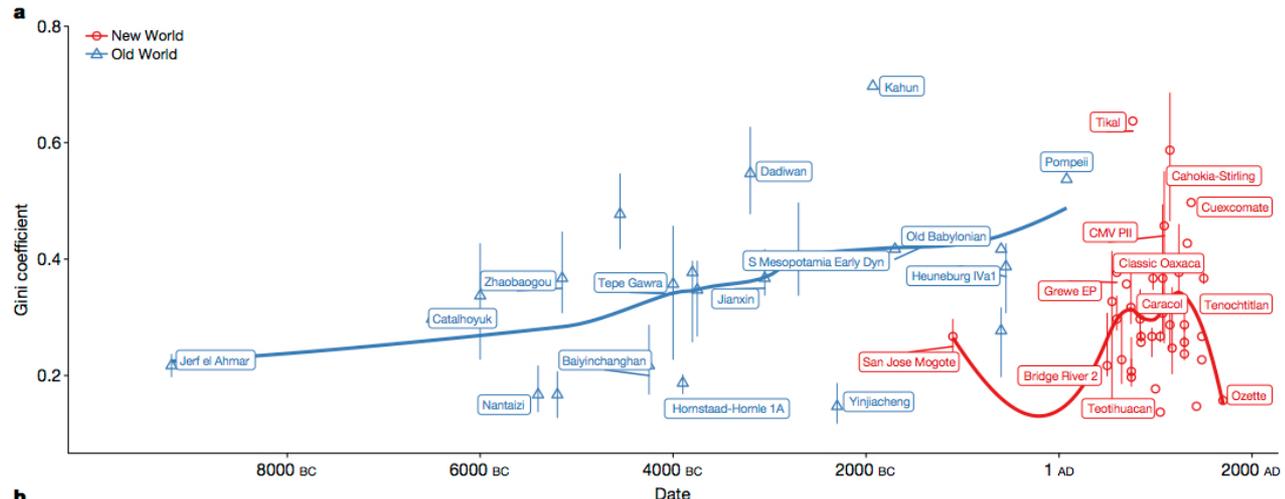
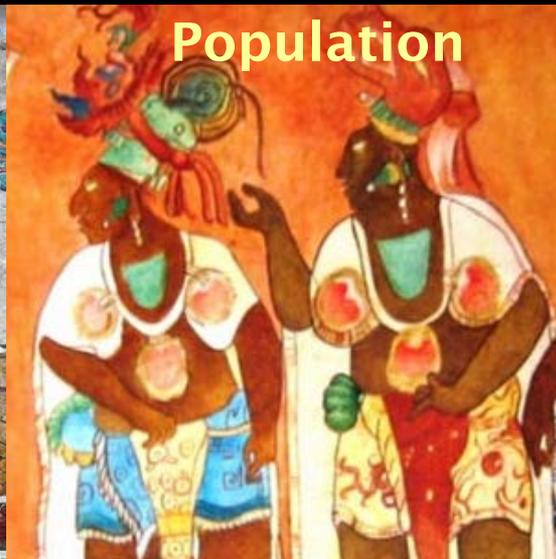


Figure 3 | Robust regression (using locally weighted scatterplot smoothing) of Gini coefficients on sample dates. a, Coefficients by absolute date of sample (calibrated BC/AD ¹⁴C, tree-ring date or calendar date); n = 62; !Kung San was excluded. b, Coefficients by Δ Years (date of sample – date of the local appearance of domesticated plants); n = 63. S Mesopotamia Early Dyn, Southern Mesopotamia Early Dynastic; CMV PII, Central Mesa Verde region Pueblo II.

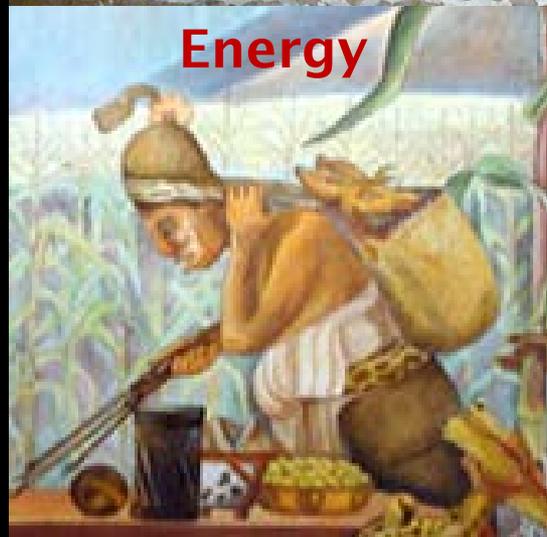
DEVELOPING ARCHAEOLOGICAL MEASURES TO ASSESS CHANGES IN SOCIETAL STRUCTURES BEFORE, DURING, AFTER THE COLLAPSE



Economy



Population

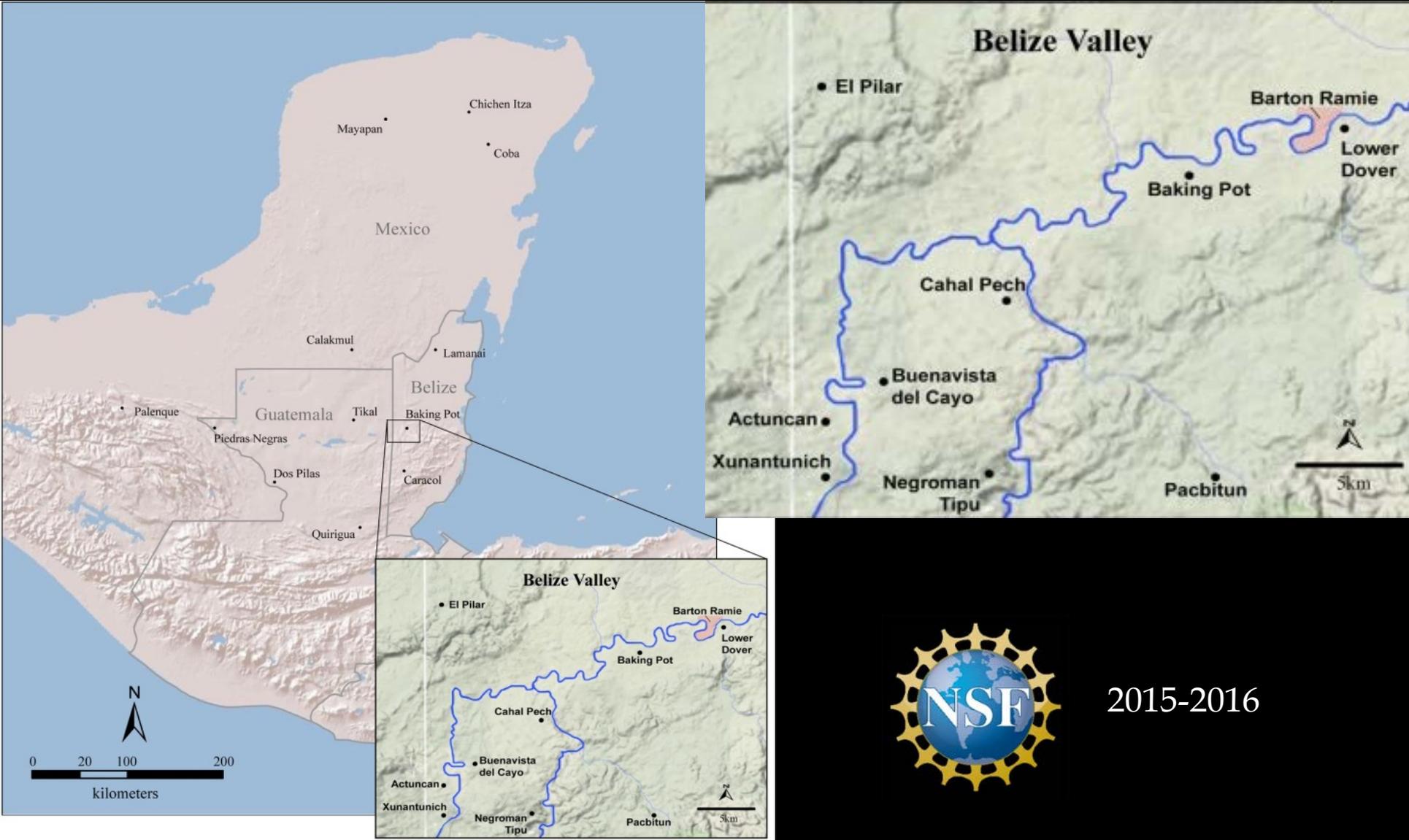


Energy



Environment

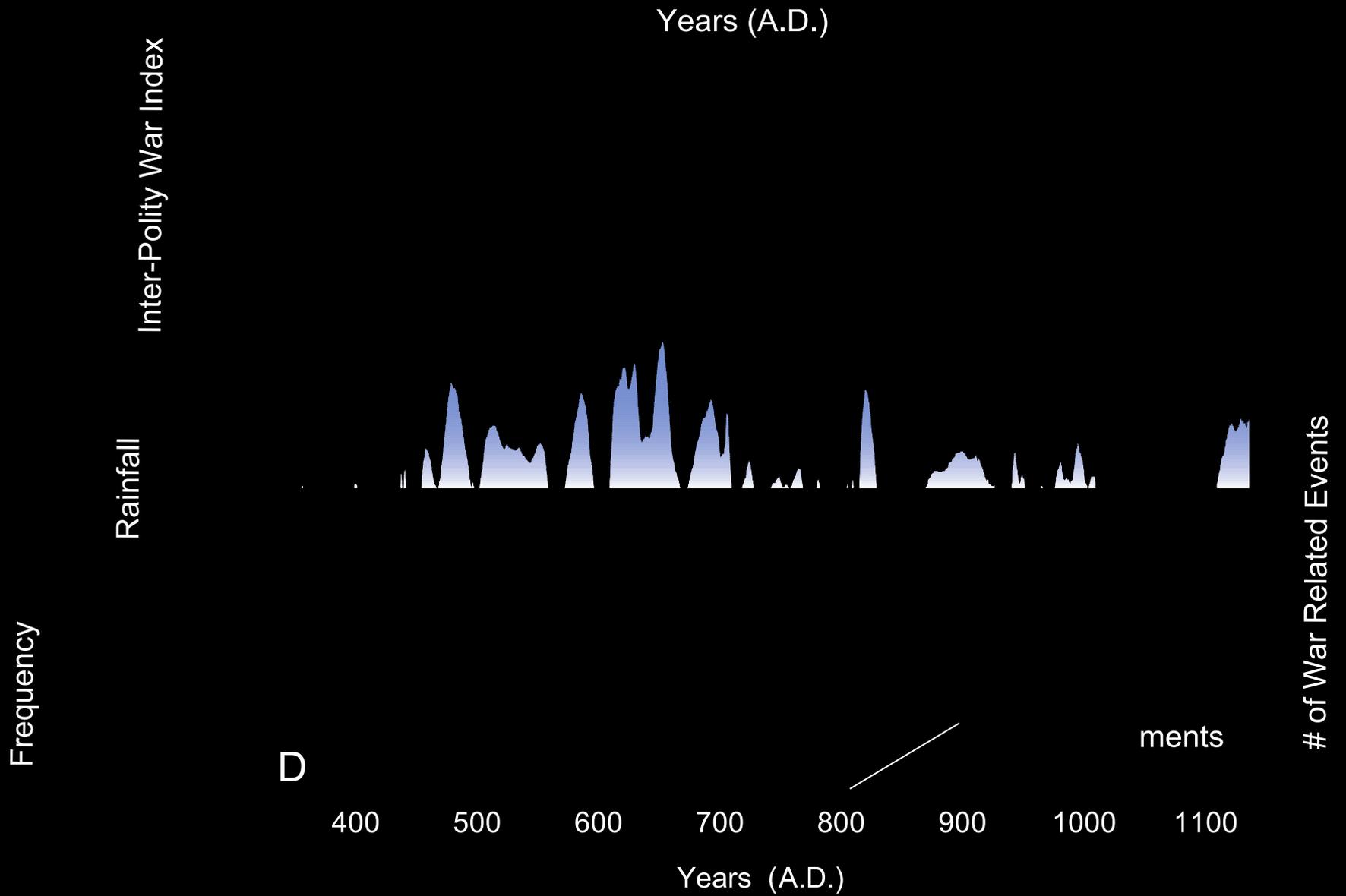
BELIZE VALLEY CASE STUDY



2015-2016

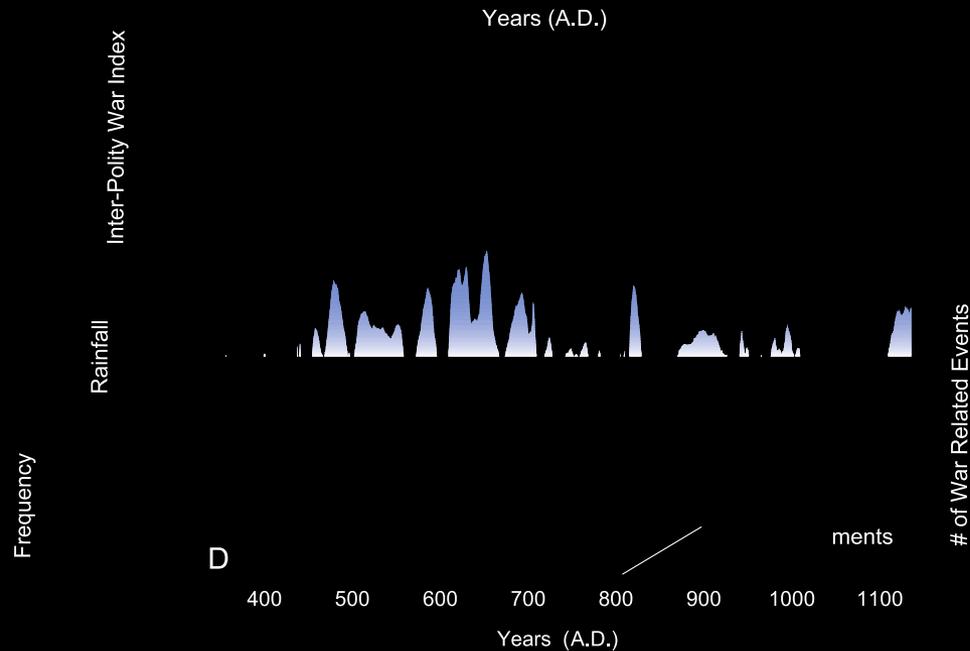


Climatic & Environmental Context

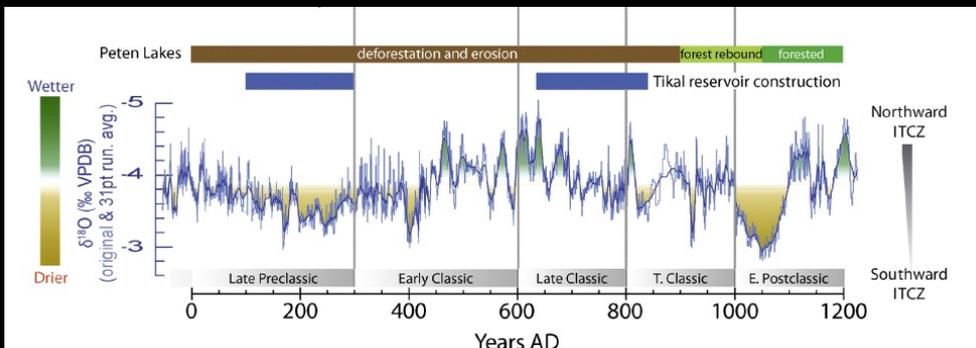


D.J. Kennett et al. (2012). Development and disintegration of Maya political systems in response to climate change. *Science*, 338(6108), 788-791.

DROUGHT, URBAN CENTERS, DATED MONUMENTS, AND WARFARE



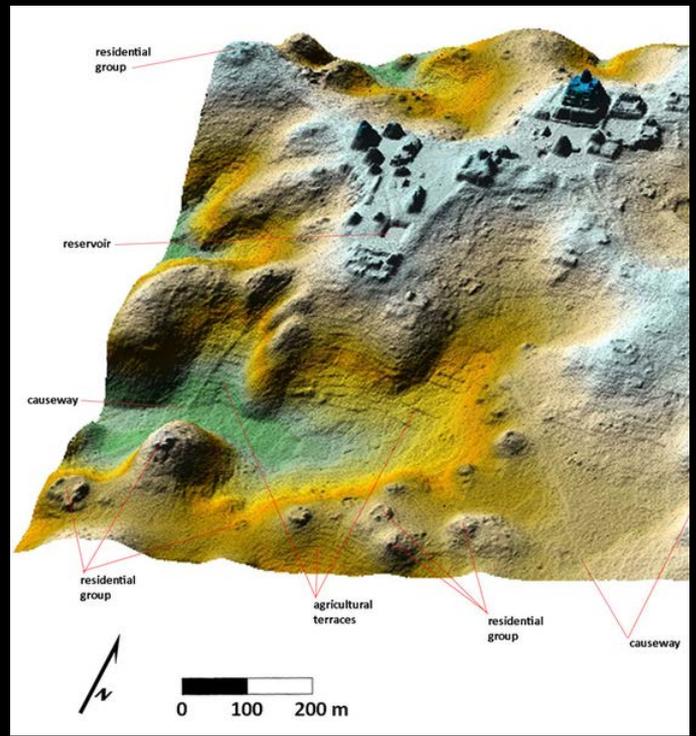
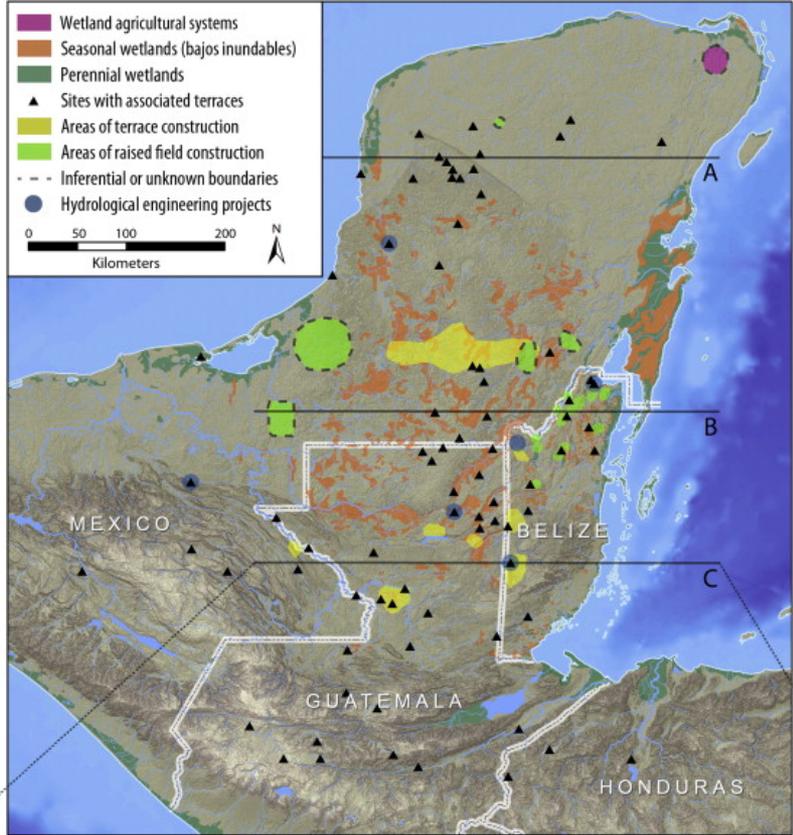
- ✓ Urban centers with dated monuments:
Decline in urban centers during 9th century droughts, rebound with increasing rainfall
- ✓ Total dated monuments:
Also shows decline in the dedication of carved monuments associated with drought
- ✓ Warfare Index:
Warfare increases with drought in 9th century
- ✗ Geographical Extent:
Disruption of political systems and urban occupation varies across different regions



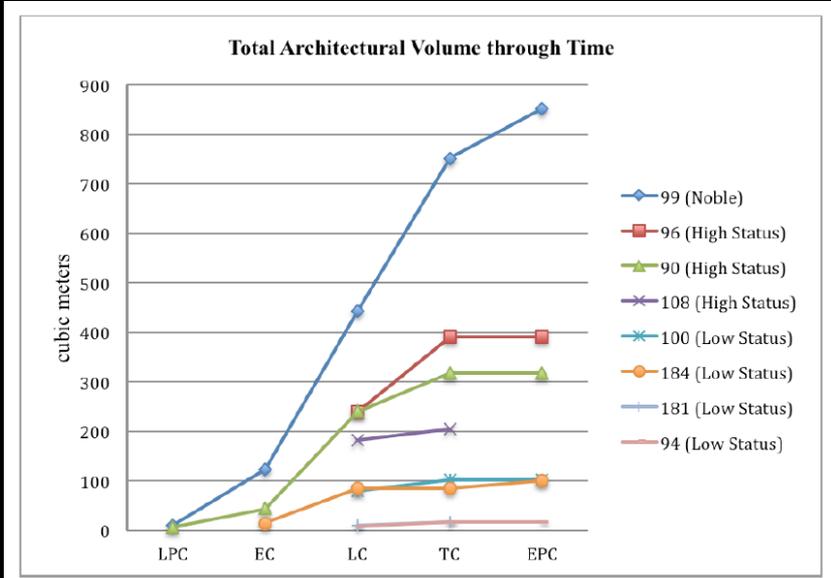
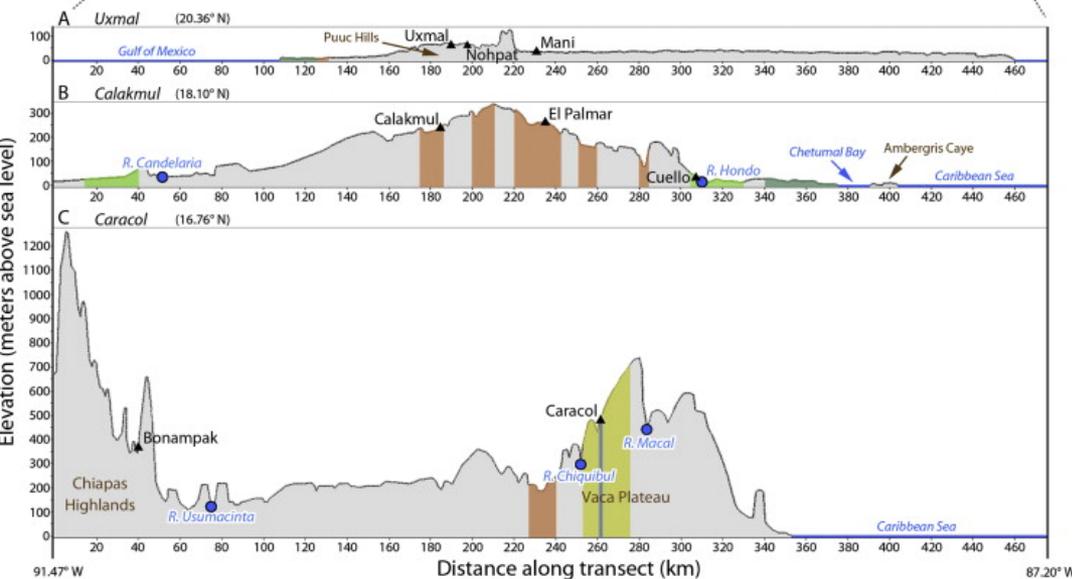
Quantitative measures essential for actually testing hypotheses.



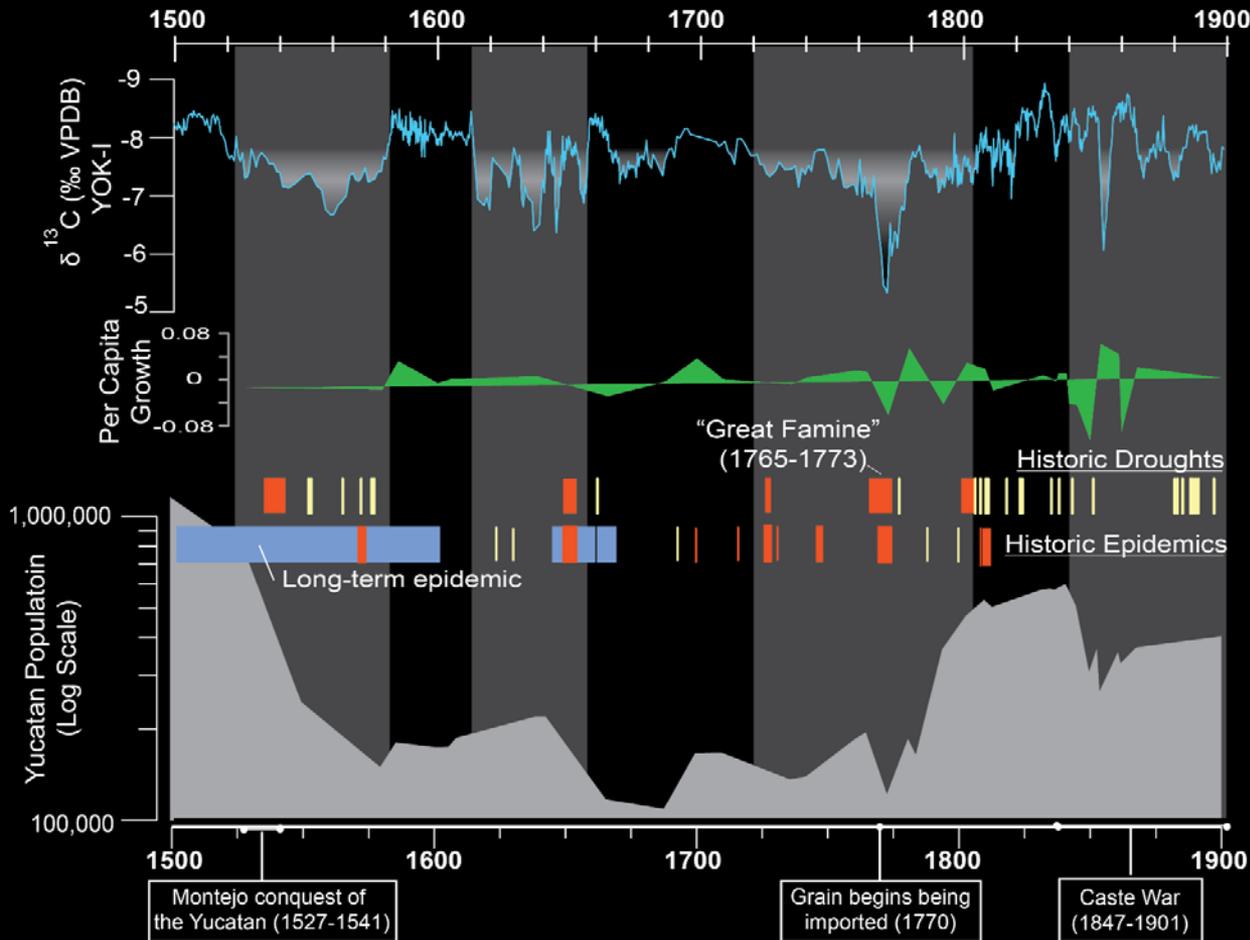
Energy
(Human Labor)



Agricultural Terraces

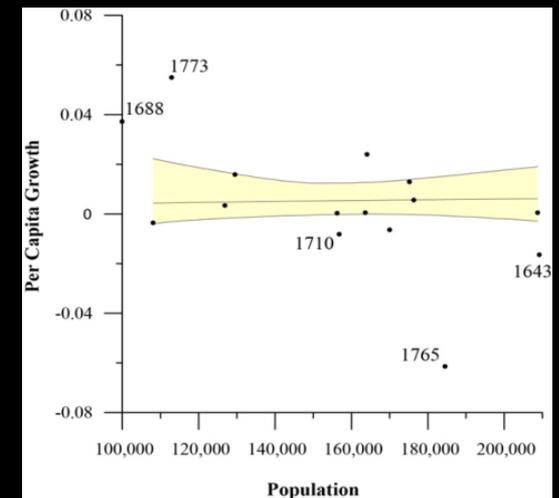


EFFECTS OF DROUGHT ON SUBSISTENCE AND DEMOGRAPHY



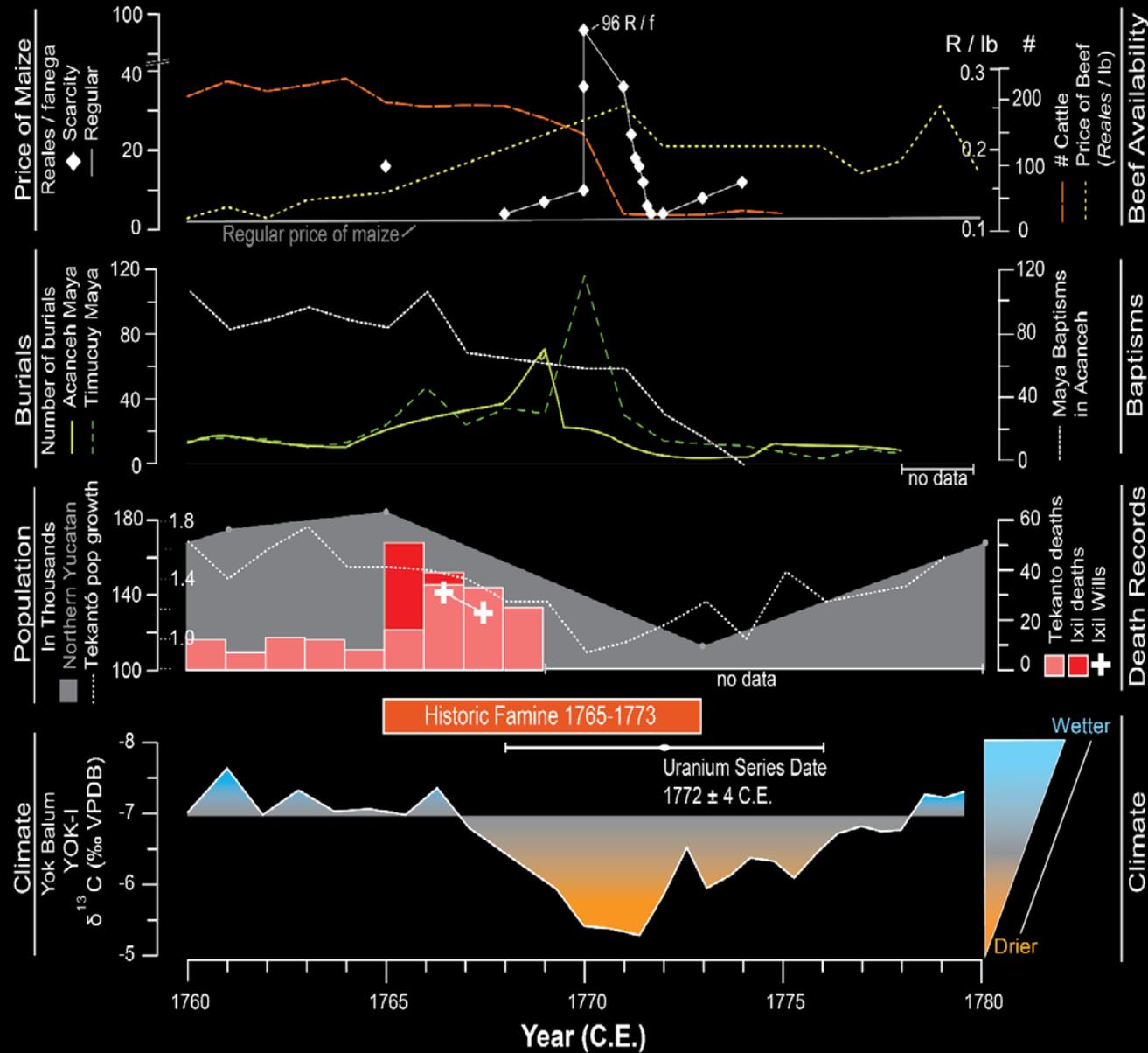
1535-1541 Drought:

“there was a **drought** in the land, and the corn having been consumed during the wars with the Spaniards, it was such that they were reduced to eating the bark of trees, especially one called *kumche*, the inside of which is soft and tender. . . . There was also a plague of locusts for five years, that left them not one green thing; and **such a famine ensued that they fell dead on the roads**, so that when the Spaniards returned they did not recognize the country” (our translation from Landa 1566: Ch. XIV).



Hoggarth, J.A., M. Restall, J.W. Wood, and D.J. Kennett (2017) Drought and its Demographic Effects in the Maya Lowlands. *Current Anthropology* 58(1). In Press.

EFFECTS OF DROUGHT ON DEMOGRAPHY IN COLONIAL YUCATAN



“The pastures and cornfields that were not eaten by locusts dried or did not germinate because in 1769 there was a **shortage and lack of rain**... But the drought worsened in 1770. The population of the peninsula suffered “imponderable havoc” from the “**defect of water**”, they even claimed that **it had not rained in the year** “on any of the peoples of this continent” (Campos Goenaga 2011:40).

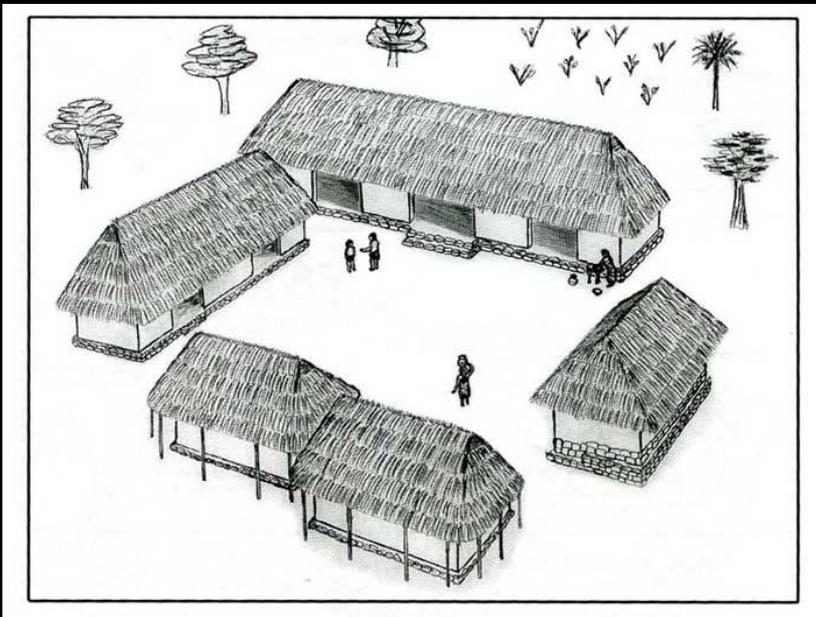
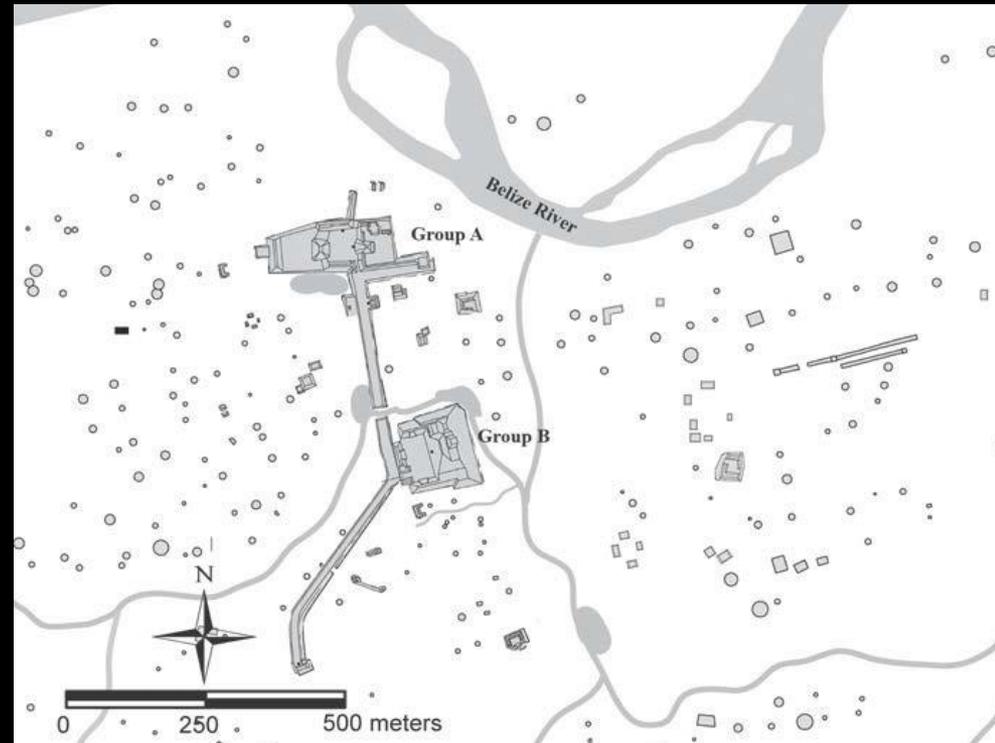
- ✓ Historic accounts describe impacts on agricultural production and food availability.
- ✓ Burial and death records show spikes in mortality during the worst part of the drought. Baptisms decline.

Hoggarth, J.A., M. Restall, J.W. Wood, and D.J. Kennett (2017) Drought and its Demographic Effects in the Maya Lowlands. Accepted as a major article with commentaries, *Current Anthropology* 58(1). In Press.



Reconstructing Population Change

RECONSTRUCTING POPULATION CHANGE



Nuclear family size in Mesoamerica = 5.5

$5.5 \times 538 \text{ mounds} = 2,959 \text{ people}$

Corrected based on % occupied per period

Barton Ramie
n= 7 (3 LC)

Cahal Pech
n=40 (31 LC)

Lower Dover
n=5 (all LC)

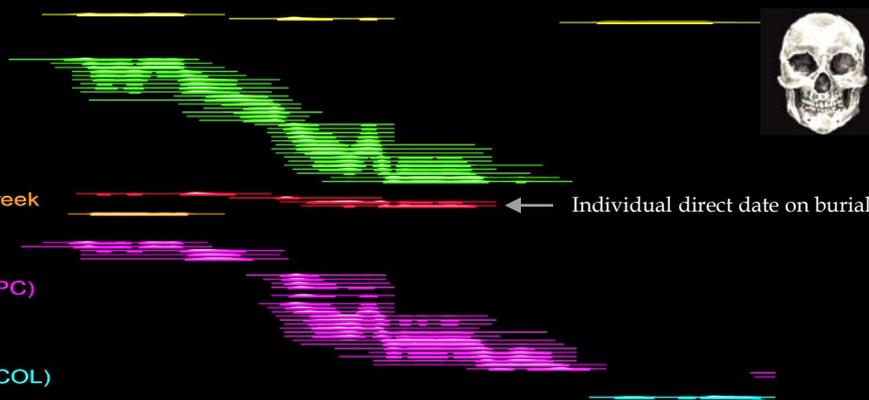
Lower Barton Creek
n=1 (LC)

Baking Pot
n=38 (35 LC or PC)

Tipu
n=18 (all PC or COL)



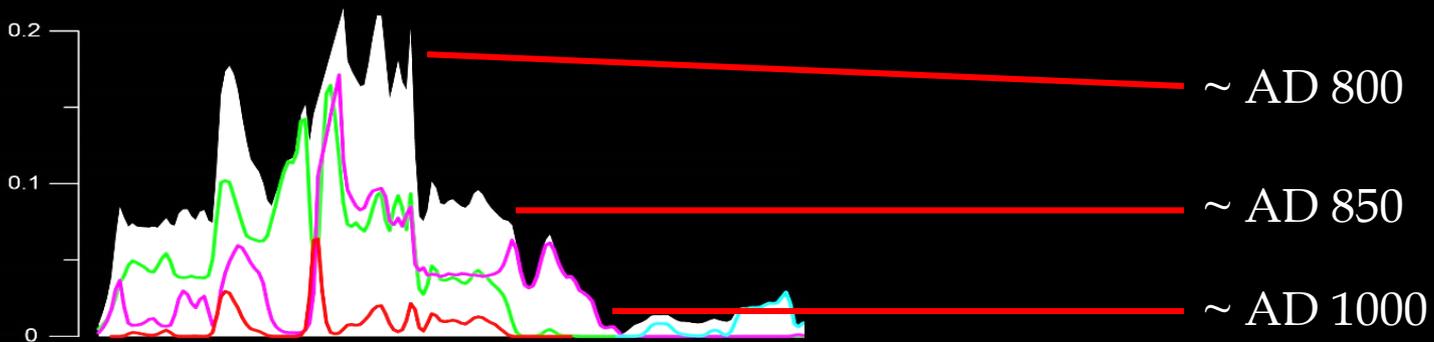
MAYA BURIAL PROJECT



3 "waves" of population decline

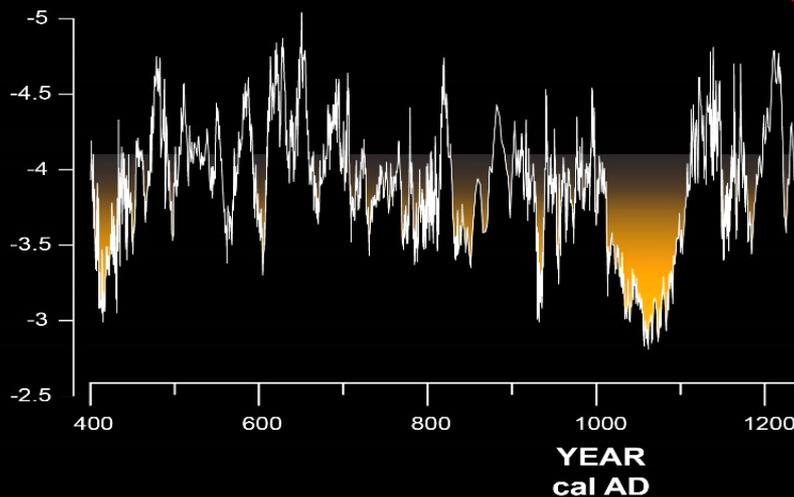
Belize Valley Burials

Probability Density
 $\delta^{14}C$ Distributions



YOK BALUM

Speleothem Record
YOK-I $\delta^{18}O$ (‰ VPDB)

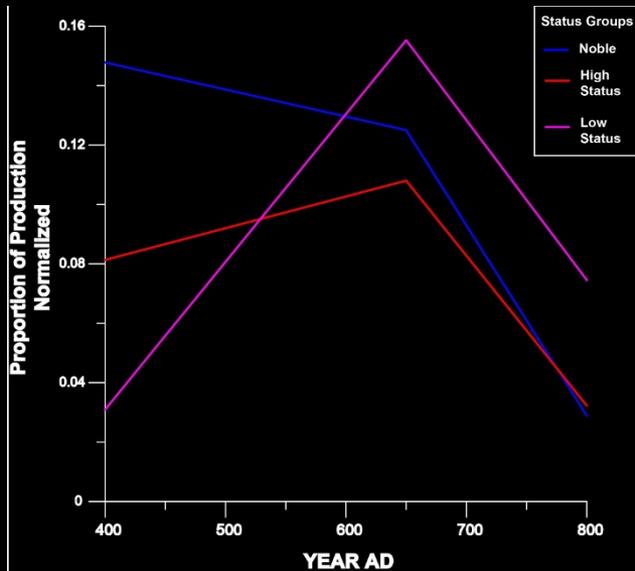


Population rebound
in Postclassic after
return to normal
rainfall

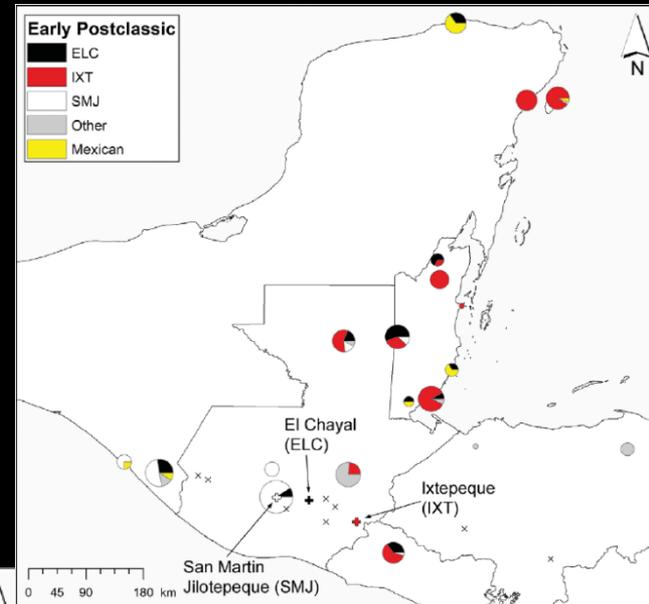
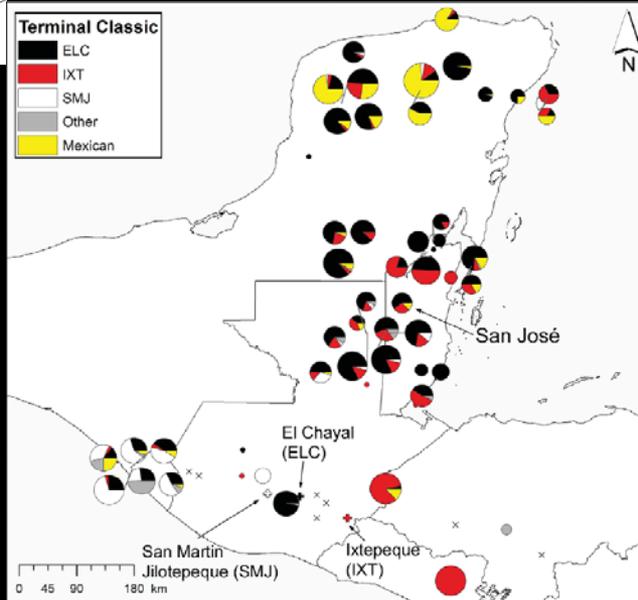
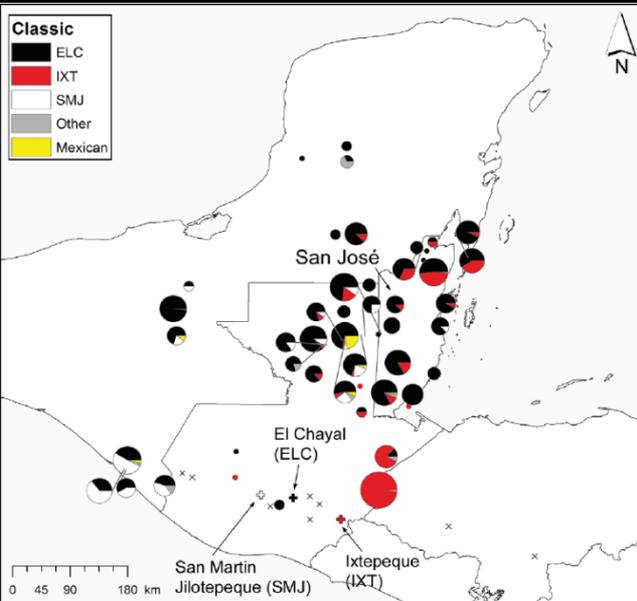


ECONOMY

Production

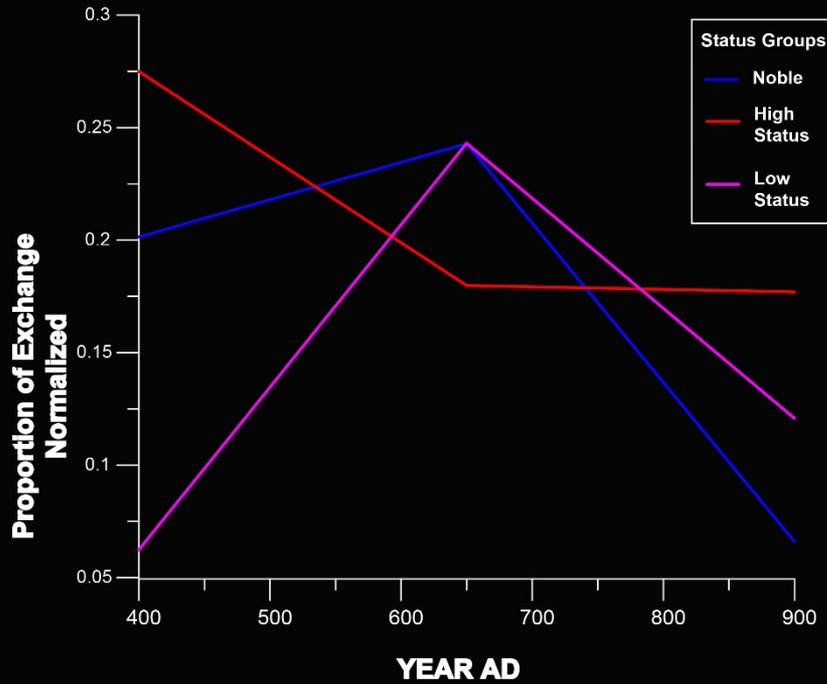


Long Distance Exchange

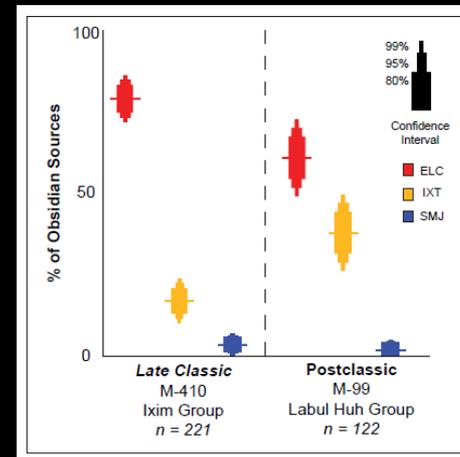
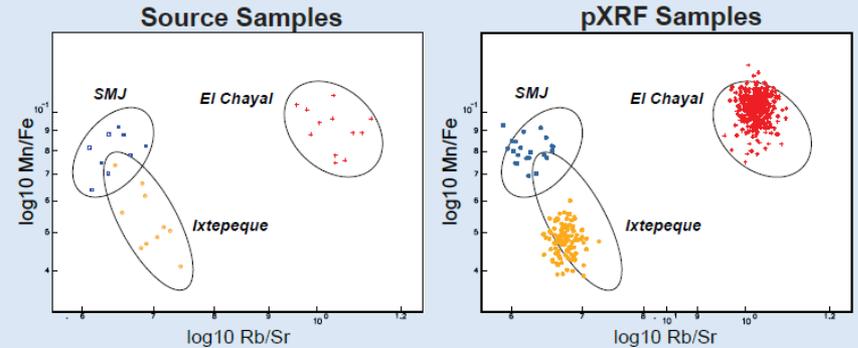


Golitko, M., Meierhoff, J., Feinman, G.M. and Williams, P.R., 2012. Complexities of collapse: the evidence of Maya obsidian as revealed by social network graphical analysis. *Antiquity*, 86(332), pp.507-523.

Exchange



Source		Mn	Fe	Zn	Ga	Th	Rb	Sr	Y	Zr	Nb
<i>El Chayal</i> n = 427	mean	782	7619	53	18	11	156	152	22	115	11
	st dev	86	982	15	1	2	11	10	2	5	1
	%rsd	11	13	28	3	16	7	7	8	5	14
<i>Ixtepeque</i> n = 127	mean	545	10430	44	18	8	110	165	20	162	10
	st dev	82	1603	11	0	2	10	18	2	22	2
	%rsd	15	15	25	2	21	9	11	9	14	15
<i>SMJ</i> n = 22	mean	642	7971	50	18	9	122	196	18	116	9
	st dev	68	715	10	0	1	8	12	1	5	1
	%rsd	11	9	20	2	13	6	6	7	5	13



ACKNOWLEDGEMENTS



I would like to thank Carey King for inviting me to participate in this session.

Funding and support for this research was provided by....

